PROJECT MANUAL

New Elementary School 12
Package 1

Forney Independent School District

Forney, Texas

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MORE THAN ARCHITECTS

PROJECT MANUAL

Project Name:	New Elementary School 12 – Package 1		
Client Name:	Forney Independent School District	Location:	Forney, Texas
Project Number:	1915-05-01	Date:	March 18, 2025

All inquiries shall be forwarded to Axel Anza, Huckabee; axel.anza@huckabee-inc.com; 800.687.1229.

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SECTION 00 2116
INSTRUCTIONS TO PROPOSERS

INSTRUCTIONS TO PROPOSERS

1.01 SEALED PROPOSALS

A. Sealed proposals addressed to Gallagher Construction Services, Construction Manager for the Forney ISD - New Elementary School 12, Forney, Texas shall be delivered to Gallagher Construction Services, 3501 Token Dr. Suite 100, Richardson, Texas 75082. Proposals are for the furnishing of all labor, materials and equipment, and performing all work required for New Elementary School 12 for Forney ISD, and in compliance with the project manual and drawings, and other contract documents, as prepared by Huckabee.

B. Attention is called to the fact that the contractor must comply with all Federal, State and Local labor laws, including Chapter 2258 Texas Government Code Title 10, which requires that the contractor pay not less than the following prevailing wage rates and rates for legal holidays and overtime, which have been ascertained by the awarding body and distributed by the Construction Manager.

C. Attention is called to the fact that the Owner is exempt from the payment of the State Sales Tax normally levied against material costs. The contract sum, as identified by the Base, shall not include any allowance for the payment of State Sales Tax on materials required to complete the work. The successful proposer, upon award of the contract, will be furnished with a permit number, which will enable him to purchase the required materials without payment of such taxes.

D. All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, and the Supplementary General Conditions are applicable to the Instructions To Proposers. A copy of the Agreements are available from the Construction Manager.

E. Bidding Documents include the Advertisement or Invitation to Bid, Instructions to Proposers, the Proposal Form, and the proposed contract documents, including any addenda issued prior to receipt of proposals.

F. Addenda are written or graphic instruments issued prior to the execution of the contract which modify or interpret the bidding documents, including drawings and the project manual, by additions, deletions, clarifications or corrections. Addenda will become part of the contract documents when the construction contract is executed. ADDENDA WILL BE PUBLISHED ON THE WEBSITE OF HUCKABEE (www.huckabee-inc.com). NO ADDENDA WILL BE MAILED OR FAXED TO ANY PLANHOLDER UNLESS REQUESTED BY THE PROPOSER.

G. Each proposer, by making his proposal, represents that he has read and understands the bidding documents.

H. Each proposer, by making his proposal, represents that he has familiarized himself with the local conditions under which work is to be performed.

I. All proposals must be prepared on the form provided by the Construction Manager and submitted in accordance with the Instructions to Proposers. When the proposal contains multiple "Proposal Items", it shall be understood that the Owner may award each Proposal Item separately, or in any combination that the Owner chooses.

J. A proposal is invalid if it has not been deposited at the designated location prior to the time and date for receipt of bids indicated in the Advertisement or Invitation to Bid, or prior to any extension thereof issued to the proposers.

K. Unless otherwise provided in any supplement to the Instruction to Proposers, no proposer shall modify, withdraw or cancel his proposal or any part thereof for thirty days after the time designated for the receipt of bids in the Advertisement or Invitation to Bid.

L. Each proposer represents that his proposal is based upon the material and equipment described in the bidding documents.

M. Each proposer shall examine the bidding documents carefully, and not later than seven (7) days prior to the date for receipt of proposals, shall make written request to the Architect for interpretation or correction of any ambiguity, inconsistency or error therein which he may discover. Any interpretation or correction will be issued as an addendum by the Architects. Only a written interpretation or correction by an addendum shall be binding. No proposer shall rely upon any interpretation or correction given by any other method.

N. No substitution will be considered unless written request has been submitted to the Architect for approval at least seven (7) days prior to the date for receipt of bids. Each such request shall include a complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance and test data and any other data or information necessary for a complete evaluation.

O. If the Architect approves any proposed substitution, such approval will be set forth in an Addendum.

P. The proposer acknowledges the right of the Owner and Construction Manager to reject any or all proposals and to waive any informality or irregularity in any proposal received. In addition, the proposer recognizes the right of the Owner to reject a bid if the bidder failed to furnish any required bid security or to submit the data required by the bidding documents, or if the bid is in any way incomplete or irregular.

Q. Each proposer agrees to waive any claim it has or may have against the Owner, the Architect/Engineer, and the respective employees, arising out of or in connection with the administration evaluation or recommendation of any proposal.

R. In case of ambiguity or lack of clearness in stating the price in the Proposal, the Owner and Construction Manager reserves the right to adopt the price written in words or to reject the Proposal.

1.02 GUARANTEES

A. Besides guarantees required elsewhere, contractor shall guarantee the work in general for one year. Contractors shall be held responsible for and must make good any defects arising or discovered in any part of his work within one year period noted on the form, and in certain other parts as required by the specifications for a long period. Where detailed specifications call for guarantees as above specified, they shall cover the special features called for.

B. In addition to guarantees called for elsewhere in these specifications, the contractor shall guarantee all of his work for a period of one year after the date of full completion against defective material or faulty workmanship that may arise within that period.

C. All guarantees must be submitted to the Architect before the final payment request will be approved.

D. We agree to repair or replace to the satisfaction of the Architect, and at no expense to the Owner, any or all work that may prove defective in workmanship or materials, or is not meeting the specification requirements within that period (ordinary wear and tear and unusual abuse or neglect excepted) together with any other work which may be damaged or displaced in so doing.

E. In the event of our failure to comply with the above-mentioned conditions within a reasonable time after being notified in writing, we, collectively and separately, do hereby authorize the Owner to proceed to have the defects repaired and made good at our expense, and will pay the costs and charges therefore immediately upon demand.

END OF SECTION

SECTION 01 1100
SUMMARY OF WORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:
   1. The "Project" of which the "Work" of this Contract is a part, is titled New Elementary School 12 for Forney ISD and is composed of a new elementary school and related site work located in Forney, Texas.
   2. The "Work" of this Contract is titled New Elementary School 12 and is defined in the Contract Documents to include, but not necessarily to be limited to:
      a. A new elementary school, including all mechanical, electrical, plumbing, and general construction work.
   3. Related Work:
      a. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.
      b. The work of other contracts is described in various contract documents prepared therefore, some of which are in the possession of the Owner and are available for inspection by interested parties.

B. Other Work:
   1. Owner (if required by Municipality, State or Federal requirements) shall provide evidence to the municipality permitting the project that an asbestos survey has been completed by a person licensed under the Texas Asbestos Health Protection Act to perform such a survey.
   2. The architect has no responsibility for the discovery, presence, handling, removal or disposal of or exposure of persons to hazardous materials or toxic substances in any form at the project site.
   3. The architect is not required to execute certifications that would require knowledge, services or responsibilities beyond the scope of the architectural service agreement.
   4. The architect assists the owner in the owner's responsibility to obtain applicable permits for demolition and construction.
   5. Contractor to review and familiarize themselves with owner's Asbestos survey and plan and shall inform every worker that they use on this project as to the availability of these surveys and plans prior to starting any work.

END OF SECTION

SECTION 01 1400
WORK RESTRICTIONS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work Included:
   1. Contractor shall comply with the following requirements concerning scope and work restrictions.
   2. If the Contractor believes that meeting the restrictions in this section would cause a delay to the intended schedule, they shall issue an RFI requesting specific modifications to that specific Work Restriction that would permit construction to continue without delay and indicating the reasons for the request. If construction proceeds without meeting any of the restriction requirements or obtaining approval for a modification of these requirements, the Contractor shall be responsible for all costs associated with removing and replacing all construction that occurred in violation of the Work Restrictions, if directed to by the Architect, without any increase in approved construction costs or schedule for the project.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.
   2. The work of other contracts is described in various contract documents prepared therefore, some of which are in the possession of the Owner and are available for inspection by interested parties.

C. Specific Project Restrictions:
   1. Before project completion and a certificate of occupancy is issued, Contractor shall provide fully established grass at locations including but not limited to all disturbed areas, under items that have been stored on site, construction trailers and storage units.

D. Project restrictions related to Quality Control
   1. The Contractor shall not be permitted to begin work on-site (other than job trailer installation and/or removal of on-site vegetation) until the Contractor has scheduled and hosted a “Foundation Pre-Construction” meeting (in person or on a conference call) with the Architect’s Construction Observer, a representative of the Special Inspection and Testing Agency (SITA), the Code-Required Structural Observer, a representative of the Structural Engineer, the Superintendent of Construction, Contractor’s Project Manager, and all foremen for subcontractors with work related to the foundation.
   2. The Contractor shall not be permitted to continue work on-site (other than job trailer installation and/or removal of on-site vegetation) more than one week after the Foundation Pre-Construction meeting (or an alternative deadline if requested by the Contractor and approved by the Architect) unless:
      a. The Contractor has obtained correspondence from the Geotechnical Engineer indicating that the Geotechnical Engineering firm has reviewed all relevant Construction Documents for conformance with their recommendations and indicated any portions of these documents which, in their opinion, do not conform with their recommendations. The term "relevant Construction Documents" shall include this Project Manual, all construction drawing sheets, any addenda issued before proposals are received, any addenda issued after proposals are received but before an Owner/Contractor Agreement is fully executed, and any changes in scope associated with a Request For Proposal (RFP) that is approved before construction begins.

b. The Contractor has obtained verification in writing from the Architect that the SITA has issued one or more acceptable statements indicating the SITA will be performing the scope of work for the SITA specified in Section 01 4533 and that the SITA as well as all SITA Staff that will be performing work on this project will meet the qualifications specified in Section 01 4533.
c. The Contractor has obtained verification in writing from the Mechanical and Electrical Engineers that the CxA has issued one or more acceptable statements indicating the CxA will be performing the scope of work for the CxA specified in Section 01 4533 and that the CxA as well as all CxA Staff that will be performing work on this project will meet the qualifications specified in Section 01 4533. This verification shall also confirm that the specified commissioning services on this project comply with the applicable version of the International Energy Conservation Code (IECC).
d. The Contractor has submitted to Forney ISD, the Building Official, and the Architect a written "Acknowledgement of Contractor's Responsibilities Related to Code-Required Quality Control". (Refer to Section 01 4533 for suggested language.)
e. The Contractor has confirmed in writing to the Architect that the Contractor has scheduled and hosted a "Quality Control Pre-Construction Meeting", following the agenda in Section 01 4533, listing the names and project roles of all attendees.

3. The Contractor shall not be permitted to drill any holes for actual piers until verifying in writing that the Structural Engineer has either determined that the conditions encountered in the Test Pier Hole report are generally consistent with those required for proposal purposes, or issued modifications to the pier design. Proposers shall assume for proposal purposes that they shall not be permitted to drill holes for actual piers until one (1) calendar week after the Test Pier Holes are drilled. It is hoped that this will take less time. This paragraph shall not apply to light pole bases.
4. The Contractor shall not be permitted to install any ACIP piles other than load test piles until verifying in writing that the Structural Engineer has either determined that the conditions encountered in the ACIP Pile Load Test report are generally consistent with those required for proposal purposes, or issued modifications to the ACIP pile design. Proposers shall assume for proposal purposes that they shall not be permitted to install piles other than load test ACIP piles until two (2) calendar weeks after the ACIP Pile load testing has been completed. It is hoped that this will take less time.
5. The Contractor shall not be permitted to apply for a Certificate of Occupancy until the Contractor has obtained a copy of each Final Report of Quality Control from every firm providing quality control services where required by the Final Report provisions of Section 01 4533 and, in addition, the Contractor has submitted to the AHJ the Final Report of Quality Control from the SITA, the Final Report of Quality Control from the CxA and the Final Report of Quality Control from the Code-Required Structural Observer. (The Contractor shall submit reports from the other quality control personnel if requested by the AHJ.)

E. Project Restrictions related to the General Framing Preconstruction Meeting
1. The Contractor shall not be permitted to install any portion of the superstructure until the Contractor has schedules and hosts a "General Framing Preconstruction Meeting" in which the following people attend: A representative of the Architect, a representative of the Structural Engineer, the SITA, the Superintendent of construction, the Contractor's Project Manager, and all foremen for subcontractors with work related to the framing.

F. Project Restrictions related to the Tornado Shelter

1. The Contractor shall not be permitted to penetrate the precast concrete walls or roof topping slab over double tees with any penetration greater than 2 inches in diameter other than the openings for the ductwork and the lower ventilation, which have structural baffling systems. This work restriction applies to all trades on the entire project. Where the Contractor is delegated design of systems, those systems shall be designed so that no penetration in the walls or roof of the shelter is greater than 2 inches in diameter. For clarification, this requirement does not permit a 2 inch diameter pipe because the outer diameter would be greater than the maximum 2 inch diameter opening permitted in the concrete.
2. The Contractor shall not be permitted to install anything other than 2 hour fire rated construction (e.g. labelled 90 minute Storm Doors) where the Tornado Shelter perimeter wall adjoins the host building.
3. The Contractor shall not be permitted to suspend any items from the shelter roof precast double tees or mount any items on the shelter precast concrete walls unless there is at least twice as much support and bracing as would be provided for the non-shelter “host” portion of the building.
4. The Contractor shall not be permitted to begin work within the outline of the Tornado Shelter floor plan area (installing any piers, foundation, utilities, etc…) until:
    a. The Contractor has obtained a copy of the Peer Review report(s) issued by the Peer Reviewer(s) and addressed to the AHJ, indicating that the contract document and all addenda have been peer reviewed for conformance with ICC 500-2014 Chapters 3, 4, 5 and 6 of by ICC 500-2014.
    b. The Contractor shall obtain written verification from the School Safety and Security Committee that the contract documents are acceptable with regards to the planning and intended operations and maintenance of Tornado Shelter(s) at the facility. It shall be permitted for the Contractor to email the Chair of the School Safety and Security Committee the following, “Could you please confirm that the contract documents for the project titled " New Elementary School 12 " are acceptable to the School Safety and Security Committee with regard to the planning and intended operations and maintenance of the Tornado Shelter at that facility?” and either accept a simple emailed response of “Yes” or discuss the email with the Chair and then email a record of the Contractor’s understanding of the conversation.
    c. The Contractor shall schedule a “Tornado Shelter Pre-Construction Meeting” as required by Section 01 3000.
    d. The Contractor shall schedule (e.g. send a Microsoft Outlook invite) a "Tornado Shelter Walk-Through" with the Architect’s Construction Observer, Architect’s Tornado Shelter Designer, the Structural Engineer and the Electrical Engineer to occur after the Contractor anticipates having the Tornado Shelter completed. It is recommended that the Contractor schedule this meeting as early as possible, to provide as much time as possible to address any deficiencies that might be identified during this walk-through. During the meeting, the Contractor shall record in writing all observations by the Design Professionals. This date shall be the target date for completion of all construction related to the function of the tornado shelter. At any time and every time that the Contractor becomes aware of any item on the critical path for the Tornado Shelter construction schedule not meeting the construction schedule anticipated, the Contractor shall reschedule the “Tornado Shelter Walk-Through” meeting and notify the Architect of the reason for rescheduling.
    e. The Contractor schedule (e.g. send a Microsoft Outlook invite) a "School Safety and Security Committee Walk-Through" with the School Safety and Security Committee and the Architect’s Tornado Shelter Designer to occur when the Contractor anticipates having the Tornado Shelter completed, including the resolution of any unresolved deficiencies identified during the "Tornado Shelter Walk-Through". It shall be permitted for this to be scheduled near the very end of construction.

5. After the Contractor has submitted precast concrete shop drawings for review but before beginning any work on the precast concrete system (e.g. pouring any panels or double tees) or performing any work on or off site related to work within the footprint of the Tornado Shelter above the finish floor elevation, the Contractor shall schedule and host a “Tornado Shelter Pre-Construction Meeting” as required by Section 01 3000.
6. Before requesting a Certificate of Substantial Completion, the Contractor shall schedule and attend a “Tornado Shelter Walk-Through” with the Architect’s Construction Observer, Architect’s Tornado Shelter Designer, the Structural Engineer and the Electrical Engineer, to occur after all items related to the ICC 500 requirements for the Tornado Shelter have been constructed and any deficiencies have been addressed.
7. Before requesting a Certificate of Final Completion, the Contractor shall schedule and attend a "School Safety and Security Committee Walk-Through" with the School Safety and Security Committee and the Architect’s Tornado Shelter Designer. During this meeting, the Contractor shall provide training to the School Safety and Security Committee on the operation and maintenance of all equipment related to the Tornado Shelter. The Contractor shall record in writing the names of all attendees.

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

B. Payment and modification procedures relating to allowances.

1.02 CASH ALLOWANCES

A. Cash Allowances shall be included in the contract sum.

B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will not be included in Change Orders authorizing expenditure of funds from this Cash Allowance. These costs shall be included in base contract sum unless noted otherwise

C. Costs Not Included in Cash Allowances: Productdelivery to site and handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing. These costs shall be included in base contract sum unless noted otherwise.

D. Architect Responsibilities:
   1. Consult with Contractor for consideration and selection of products, suppliers, and installers.
   2. Select products in consultation with Owner and transmit decision to Contractor.
   3. Prepare Change Order.

E. Contractor Responsibilities:
   1. Assist Architect in selection of products, suppliers, and installers.
   2. Obtain proposals from suppliers and installers and offer recommendations.
   3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.

F. Differences in costs will be adjusted by Change Order.

G. At closeout of Contract, funds remaining in Cash Allowance will be credited to Owner by Change Order.

1.03 ALLOWANCES SCHEDULE

A. Section 01 5000 - Temporary Facilities and Control: Include the stipulated sum of $750 for purchase of project identification sign.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Schedule of Values.

E. Progress meetings.

F. Submittal Schedule.

G. Submittals for review and project closeout.

H. Number of copies of submittals.

I. Submittal procedures.

J. Progress Payments.

K. Contractor's Daily Field Report.

L. Request For Information.

1.02 RELATED REQUIREMENTS

A. Section 01 1100 - Summary of Work

B. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

C. Section 01 6000 - Product Requirements: General product requirements.

D. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

E. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. The Notice to Proceed shall not be issued by the Architect until the Agreement (or Amendment, if Contractor is a Construction Manager at Risk) including final GMP and all exclusions or other post Proposal agreements, have been signed and approved as well as all required payment and performance bonds and insurance, and furnished to the Architect.

B. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

C. Make the following types of submittals to Architect:
   1. Requests for Information (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

12. Warranty request and corrective action descriptions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. This includes submittals for review, information, requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), field reports and meeting minutes, preliminary closeout for review, final project record documents closeout submittal and any other document any participant wishes to make part of the project record.
   2. Contractor and Architect are required to use this service at no cost to the Contractor.
   3. It is Contractor's responsibility to submit documents in allowable format.
   4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no charge.
   5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
   6. Paper document transmittals will not be reviewed.
   7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected service is:
   1. Autodesk Construction Cloud (ACC): https://acc.autodesk.com.
      a. Contractor will receive an emailed invitation to the ACC project upon award.

C. Training: External user tutorials are availible at https://learnacc.autodesk.com. The awarded General Contractor will be required to become familiar with the program prior to Notice to Proceed being issued.

D. Project Closeout: Architect will determine when to terminate the service for the project. Contractor is responsible for providing digital and hard copies of the final project record documents closeout submittal to the Owner. Should Owner forgo hard copies, Contractor shall submit a credit to the Owner.

3.02 PRECONSTRUCTION MEETINGS

A. A Kick-Off Pre-Construction meeting will be scheduled to be held upon notification by the Architect.
   1. Provide attendance by authorized representatives of the Contractor and major subcontractors.
   2. The Architect will advise other parties, including the Owner, and request their attendance.
   3. The Architect shall arrange, preside, and record the minutes of the pre-construction meeting.
   4. A pre-construction meeting agenda will be issued by the Architect at the meeting.
   5. Agenda items to be discussed include:
      a. Self introductions
      b. Design concept, scope, and objectives
      c. Tornado Shelter Orientation with a special reminder that no openings greater than 2” diameter shall be permitted in any precast concrete walls or double tees other than the duct openings and lower ventilation opening(s), which are structurally baffled.
      d. Communications

e. Contractor's responsibilities
f. Documentation and notification
g. Progress Meetings
h. Submittals/Substitutions
i. Project Administration
j. Project Closeout
k. Warranty Phase

B. Foundation Pre-Construction Meeting
1. Before beginning any work on-site (other than job trailer installation and/or removal of on-site vegetation) the Contractor shall schedule and host a "Foundation Pre-Construction" meeting (in person or on a conference call) with the Architect's Construction Observer, a representative of the Special Inspection and Testing Agency (SITA), the Code-Required Structural Observer, a representative of the Structural Engineer, the Superintendent of Construction, Contractor's Project Manager, and all foremen for subcontractors with work related to the foundation.

C. Quality Control Pre-Construction Meeting
1. Within one week after the "Foundation Pre-Construction Meeting", the Contractor shall schedule and host a "Quality Control Pre-Construction Meeting" following the Agenda in Section 01 4533.

D. Tornado Shelter Pre-Construction Meeting
1. Meeting Date: As early as practically possible, the Contractor shall submit the items required for coordination with the Precast Concrete Submittal and then, after submitting the Precast Concrete shop drawings, host a "Tornado Shelter Pre-Construction Meeting". The Contractor shall schedule this meeting in advance, to accommodate attendee availability.
2. Meeting Location: The meeting shall occur at Huckabee's Fort Worth office located at 801 Cherry Street, Suite 500, Fort Worth, Texas, where there are sufficient facilities to host this meeting.
3. Meeting Purpose: The purpose of this meeting is to provide an opportunity for coordination between the Contractors, Subcontractors, and Design Professionals. This meeting is a time for the subcontractors to coordinate the schedule and scope of their work with other subcontractors with care given in regards to the overall scope and code requirements for the construction of the Tornado Shelter. This meeting also gives the Contractor and Subcontractors an opportunity to ask the Design Professionals questions relative to the design intent of the Tornado Shelter. Any questions relating to the Tornado Shelter that are not presented by the Contractor or Subcontractors during the meeting must be submitted as a formal RFI.
4. Meeting Attendees: The Contractor shall record the list of attendees, and whether or not each individual attended in person or on the phone. The Owner's Representative shall be invited but not be required to attend. However, the following shall be in attendance for the meeting to take place. As this is a large group, the Contractor should attempt to schedule this meeting as early as possible. Where listed to be "in person" below, they shall be physically present before the meeting can begin; otherwise, attendees may join the meeting by phone but must be on the phone before the meeting can begin. All attendees hired by the Contractor shall fully engage in the discussion until they are dismissed. If any of the following individuals cannot attend, the meeting shall be rescheduled at no cost to the Owner and without allowing any increase to the construction schedule. The Architect shall reserve the right to allow the meeting to proceed with minor variations to this requirement, at the Architect's sole discretion.
a. Architect's Tornado Shelter Designer, in person
b. Architect's Construction Observer, in person
c. The Structural Engineer of Record, or a representative, in person

d. The Mechanical Engineer of Record, or a representative
e. The Electrical Engineer of Record, or a representative
f. The Technology Designer, or a representative
g. The Special Inspection and Testing Agency's Construction Materials Engineer, or a representative
h. Contractor's Superintendent, in person
i. Contractor's Project Manager, in person
j. Contractor's individual designated to coordinate Quality Control
k. Precast Concrete Detailer, in person
l. Electrical Subcontractor, in person
m. Access Control Installer, in person
n. Storm Door Installer, in person
o. Structural Steel Detailer
p. HVAC Subcontractor
q. Plumbing Subcontractor
r. Coiling Door Installer
s. Camera Installer
t. Fire Sprinkler RME

5. Materials: The Contractor shall bring at least one full-size hard copy of all submittals prepared to date (draft or otherwise) related to the Tornado Shelter (anything touching the Precast Concrete or within the Precast Concrete) and an electronic copy of the same items, so that the items can be projected onto screens for all attendees to see.
6. Agenda:
   a. Special Inspection and Testing Agency (SITA) Requirements
      (Dismiss SITA)
   b. Code-Required Structural Observation Requirements
   c. Verify that all non-baffled penetrations will be less than 2" diameter.
   d. Verify 2 hour fire rating at walls adjoining host building
      (Dismiss Fire Sprinkler RME)
   e. Camera, Electrical, Precast Coordination
      (Dismiss Camera Installer)
   f. Coiling Door, Electrical, Precast, Shelter Controls Coordination
   g. Structural Steel, Coiling Door Coordination
      (Dismiss Coiling Door Installer)
   h. Gas Main Shutoff, Potable Water Storage Pressurization, Shelter Controls Coordination
      (Dismiss Plumbing Subcontractor)
   i. HVAC, Structural Steel, Precast Coordination
      (Dismiss HVAC Subcontractor and Structural Steel Detailer)
   j. Storm Louver Installation Sequence, Precast Coordination
      (Dismiss Mechanical Engineer)
   k. Storm Door, Hardware, Access Control, Shelter Controls Coordination
   l. Storm Door, Storm Door Anchorage, Access Control, Electrical, Precast Coordination
   m. Storm Door Installation Sequence, Precast Coordination
      (Dismiss Storm Door Installer)
   n. Shelter Control Room Equipment, Furniture, Handicap Accessibility, Controls Coordination
      (Dismiss Electrical, Access Control, Technology Designer and Electrical Engineer)
   o. Storm Window Installation Sequence, Precast Coordination
   p. Shelter Signage
   q. Review Requirements of Section 01 7800 Closeout Submittals

E. Framing Pre-Construction Meeting: The Contractor shall not be permitted to install any portion of the superstructure above the foundation until the Contractor has scheduled and held a "General Framing Preconstruction Meeting" in which the following people attend: A representative of the Architect, a representative of the Structural Engineer, the Special Inspection and Testing Agency (SITA), the Superintendent of construction, the Contractor's Project Manager, and all foremen for subcontractors with work related to the framing.

3.03 SCHEDULE OF VALUES AND DRAWDOWN SCHEDULE

A. Within twenty-one (21) calendar days following Notice to Proceed, the Contractor shall submit a Schedule of Values (using the breakdown of the Construction Schedule activities) for review by the Owner's Representatives. The Schedule of Values will allocate a dollar value (cost) for each activity of the Construction Schedule. Each activity cost allocation shall include a labor, equipment and material cost and a pro rata contribution to overhead and profit. The sum of all activity costs shall be equal to the total Contract Sum. Each activity cost shall be coded with a cost code corresponding to the subcontractor responsible for the Work so that subtotals for each division of the Work can be prepared.

B. Within twenty-one (21) calendar days following Notice to Proceed, the Contractor shall submit a Drawdown Schedule showing anticipated monthly payments from the Owner for coordination of allocated funds for the Project.

C. Within thirty (30) calendar days following Notice to Proceed, the Contractor shall participate in a conference with the Owner's Representatives to review, evaluate and approve the Schedule of Values and Drawdown Schedule. The approved Schedule of Values and Drawdown Schedule shall, in the best judgment of the Contractor, the Project Manager, and the Architect represent a fair, reasonable, and equitable dollar (cost) allocation for each activity on the Construction Schedule.

3.04 PROGRESS MEETINGS

A. Schedule and administer jobsite meetings throughout progress of the Work in intervals agreed to at the Preconstruction Meeting.

B. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings. Agendas and prior meeting minutes shall be distributed 24 hours prior to meeting.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers (as invited), Owner, Architect, as appropriate to agenda topics for each meeting. Representation should be consistent throughout project.

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. Review of off-site fabrication and delivery schedules.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Coordination of projected progress.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on progress schedule and coordination.
   13. Status of Request for Information (RFI).
   14. Status of Request for Change Proposal (RFP).
   15. Other business relating to work.

16. Construction forecast for 3 weeks.
17. Weather Delay Requests.
18. Quality Control.

E. Record minutes and distribute typewritten copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.
   1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
   2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
   3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

3.05 SUBMITTAL SCHEDULE

A. Within twenty-one (21) business days following the Notice to Proceed, the Contractor shall submit a Submittal Schedule for review by the Architect and Owner. This schedule shall coincide with the approved Construction Schedule accommodating the submittal review and material selection times as required by Architect, Owner or Owner's Representatives. In the event a submittal schedule is not provided and approved by the Architect, Owner, or the Owner's Representative at the submission of the 2nd pay application, the 2nd pay application will be held until the submittal schedule is complete as noted above.

B. This schedule shall list all required submittals, product data, and samples for the project. Each item to be submitted shall include the date to be submitted, review time and the scheduled installation date. All submittals shall be listed and sequenced within the Submittal Schedule in accordance with the approved Construction Schedule.

C. The Architect and Owner will review the Submittal Schedule, provide revision comments and return it to the Contractor within fourteen (14) business days. If revisions are required, the Contractor shall then resubmit a revised Submittal Schedule to the Architect and Owner within fourteen (14) business days and thereafter until approved,

D. Submittals, product data and samples submitted out of sequence to the approved Submittal Schedule or Construction Schedule will be subject to return as unchecked and required to be resubmitted at a date coinciding with these schedules. The Submittal Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the Work within each and every Contract required Milestone and Completion date. Omissions and errors in the approved Submittal Schedule shall not excuse the Contractor from providing required submittals, product data or samples, nor excuse the Contractor from meeting the Contract required Milestones and Completion date.

3.06 SUBMITTAL DEFINITIONS AND REQUIREMENTS

A. Shop Drawing
   1. Shop drawings, diagrams, schedules and other data specifically prepared for the work by the contractor, subcontractor, manufacturer, or supplier to illustrate some portion of the work.

B. Product Data
   1. Product data are illustrations, standard schedules, performance charts, instructions, and brochures, furnished by the contractor to illustrate materials or equipment to illustrate some portion of the work.

C. Sample
   1. Physical examples which illustrate materials for some portion of the work evaluated for product compliance.

D. Color Sample

1. Physical examples which illustrate color or texture for use in color selection.

E. Submittal
   1. The submittal is the compilation of the shop drawing, product data, sample, color sample as requested by the specifications.

3.07 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 conformance with information given and the design concept expressed in the contract documents.

C. The Architects review of the Contractors submittal shall be limited to examination of an initial submittal and one resubmittal. The Architect's review of additional submittals, beyond that of the initial and resubmittal, will be made only with prior written approval of the Owner after notification by the Architect.

D. Contractors review of submittals shall be consistent with A201 – General Conditions. Areas of deviation from the Contract Documents will be represented by revision clouds, Green in color, made by the General Contractor on the associated PDF document. In the event there are no clouded areas identified, it can be assumed that the associated submittal has been reviewed in full by the General Contractor and are deemed approved. No further review by the Architect is required.

E. Samples
   1. Contractor shall submit all products which require a color selection. Contractor shall only submit actual product sample. Remainder of submittal shall be retained by contractor. Refer to color sample procedures below.
   2. Provide sample identical to the precise article proposed to be provided. If actual sample is not provided for substitution review, submittal will be rejected.
   3. Unless otherwise specified, submit one sample which will be retained by the Architect.
   4. Samples will be reviewed only for aesthetic, color, or finish selection.

F. Fax submittals are not acceptable.

G. Submittals related to the Tornado Shelter: When the Precast Concrete system is the predominant Tornado Shelter system, the development of the Precast Concrete submittal requires close coordination with other trades. Precast concrete submittals shall be returned "revise and resubmit" until the Contractor has submitted the following items to the Design Professionals responsible for the design of each item (e.g. ductwork to the Mechanical Engineer) and received them back without being marked "revise and resubmit". It shall be permitted for the Contractor to prepare submittals with only the specific items below or submit the specific items below as part of larger submittals (e.g. submit only the portion of duct in baffling, or submit all ductwork for the Shelter, or all ductwork for the entire project). It shall not be required for the Contractor to mark any submittals with any special designations to identify which submittals are related to Tornado Shelter work. Because it is possible that the Precast Concrete Engineer may require/request a change to the following items, The Contractor shall not proceed with any of the work (e.g. purchasing, manufacturing, assembling, installing, etc…) associated with the following items (e.g. even if they are returned "no exceptions noted") until the Precast Concrete submittal has been returned "no exceptions noted" or "exceptions noted".
   1. Items to be reviewed by the Architect and the Structural Engineer:
      a. Storm Doors/Shutters. The Storm Door/Shutter submittal(s) shall include:

1) A customized list of all hardware and components mounted on each storm door/shutter, including any access control, security and fire alarm systems that serve storm doors/shutters. This list shall include key, access control pads, remote locking functionality requirements for each storm door/shutter.
2) Documentation showing compliance with ICC 500-2014 testing and labeling requirements for each assemblage of components for each storm door/shutter, crossing off any items on the document that will not be installed in that assemblage.
3) Specific details for anchorage that either verify the anchorage details shown on the contract drawings for coordination and proposal purposes are acceptable, or modify those details as required structurally.

b. Storm Louvers: The Storm Louver submittal(s) shall include:
1) Documentation showing that the free area of the storm louver provides the free area listed in the code analysis on the construction drawings.
2) Documentation showing compliance with ICC 500-2014 testing and labeling requirements for the storm louver. Note: It shall not be required to provide evidence of testing minimum size louvers for the smaller louvers associated with lower baffling chamber inner openings because those are not relied upon for debris impact resistance.
3) Specific details for anchorage that either verify the anchorage details shown on the contract drawings for coordination and proposal purposes are acceptable, or modify those details as required structurally.

c. Storm Windows: The Storm Window submittal(s) shall include:
1) Documentation showing compliance with ICC 500-2014 testing and labeling requirements the storm windows.
2) Specific details for anchorage that either verify the anchorage details shown on the contract drawings for coordination and proposal purposes are acceptable, or modify those details as required structurally.

2. Items to be reviewed by the Mechanical Engineer:
a. Portions of ductwork routed through structural baffling systems
b. Portions of plumbing routed through the precast concrete walls and/or concrete roof topping slab, providing dimensions to each location. Note: It shall not be permitted for any penetration in the walls and/or concrete roof topping slab to be greater than 2” diameter, which means the pipes shall have an outside diameter less than 2”.
c. Portions of fire sprinkler lines that are routed through precast concrete panels, providing dimensions to each location. Note: It shall not be permitted for any penetration in the walls and/or concrete roof topping slab to be greater than 2” diameter, which means the pipes shall have an outside diameter less than 2”.

3. Items to be reviewed by the Structural Engineer:
a. Structural steel baffling for ductwork, depicting the ductwork (including flanges) with dashed lines. The ductwork shall be dimensioned according to direction from the Subcontractor providing the ductwork.
b. Structural steel sill angle and bolts for the coiling doors

4. Items to be reviewed by the Electrical Engineer:
a. Conduit raceways and junction boxes to be embedded in or mounted on the precast panel (including embedment depths, conduit size, offsets,etc…)

5. Items to be reviewed by the Technology Consultant:
a. Conduit raceways and junction boxes to be embedded in or mounted on the precast panel (including embedment depths, conduit size, offsets,etc…)
b. Control buttons, boxes and signage for storm doors/shutters, gas main shutoff, coiling doors for ventilation, water storage pressurization.

6. Additional items to be provided to the Precast Concrete Detailer:

a. The anchorage details and specific locations for every anchor of every component that will be anchored to the walls or suspended from underneath the roof structure, unless the anchorage will be no deeper than ¾". Note: Twice the typical anchorage for all these systems shall be provided by the Contractor (e.g. normal ductwork hangers spaced at half the typical spacing for normal occupancy areas). This shall include but not be limited to the following systems if their anchorages will be deeper than ¾":
   1) -Ductwork supports
   2) -Plumbing supports
   3) -Light Fixtures
   4) -Conduit attachments
   5) -Ceiling systems
   6) -Coiling doors for the upper and lower ventilation openings
   7) -Nonloadbearing wall bracing
   8) -Basketball Goal supports
   9) -Wall-Mounted Padding
   10) -Scoreboards/Clocks
   11) -Speakers
   12) -Built-In Furniture
   13) -Signs
   14) -Fire Extinguishers
   15) -Owner Furnished Owner Installed Items (e.g. First Aid Kit, Medicine Cabinet)

b. The embedment details for any of the above systems requiring items to be embedded in the precast concrete panels. Note: It shall not be permitted for any penetration in the precast concrete walls and/or roof topping slab to be greater than 3.5 square inches other than the openings which are structurally baffled (e.g. ductwork and lower ventilation).

H. 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.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

A. Within sixty (60) days following the Notice to Proceed, the Contractor shall submit a list of Expected Closeout Documents for review by the Architect. This list shall include project record documents, operation and maintenance data, warranties, bonds, contract forms, health/safe environment data, attic stock sign offs, Owner training, certifications and inspections, and other types as indicated. All items on the list shall be titled with spec section number and general description - Example: "09 3000 Tiling - 1 year warranty".

B. The Architect will review the list of Expected Closeout Documents, provide revision comments and return it to the Contractor within fourteen (14) business days. If revisions are required, the Contractor shall then resubmit a revised list to the Architect and Owner within fourteen (14) business days and thereafter until approved.

C. Contractor may submit Closeout Documents by Specification Division in full as scopes of work are completed.

D. Submit Correction Punch List for Substantial Completion.

E. Submit Final Correction Punch List for Substantial Completion.

F. Submit for Owner's benefit during and after project completion.

G. See Section's 01 7000 and 01 7800 for additional details.

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.

B. Extra Copies at Project Closeout: See Section 01 7800.

C. Samples: Submit one sample as specified in individual specification sections which will be retained by Architect. All other samples required by the individual specification section shall be retained by the Contractor.
   1. After review, Contractor shall produce duplicates if needed for other purposes.
   2. The Architect's sample will not be returned to Contractor.

3.10 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Transmit using approved form.
   2. Acceptable Manufacturers
      a. Manufacturers submitted shall be as per the acceptable manufacturers listed in each specification. For additional manufacturers requiring approval, reference Section 01 6000 – Product Requirements.
   3. Sequentially identify each item. For revised submittals use original number and a sequential alphabetical suffix.
   4. Submittals shall be numbered as follows:
      a. Number shall be Architects project number followed by the appropriate specification section - consecutive submittal number for section.
      b. Example - 1234-01-01 Tiling 09 3000 - 5.
      c. When material is re-submitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.
      d. On re-submittals, cite the original submittal number for reference.
      e. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.
      f. When multiple projects are administered under one contract, contractor shall submit separate submittals for each project. Failure to submit separately will result in a rejected submittal review.
      g. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.
         1) Partial submittals may be rejected as not complying with the provisions of the Contract.
         2) The Contractor may be held liable for delays so occasioned.
         3) Multiple projects bid under a single prime shall package submittals separately for each project.
   5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   6. 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.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   7. 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. Upload submittals in electronic form to Electronic Document Submittal Service website.
   8. Schedule submittals to expedite the Project, and coordinate submission of related items.

a. For each submittal for review, allow 14 days excluding delivery time to and from the Contractor.

9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
10. Provide space for Contractor and Architect review stamps.
11. When revised for resubmission, identify all changes made since previous submission.
12. Revisions:
    a. Make revisions required by the Architect.
    b. If the Contractor considers any required revision to be a change, he shall so notify the Architect as provided for in the General Conditions.
    c. Make only those revisions directed or approved by the Architect.
    d. The contractor shall be responsible for delays caused by rejection of inadequate or incorrect submittals.
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 not be recognized or processed.

B. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.11 ELECTRONIC DRAWING FILE REQUEST

A. Upon Award of Contract:
1. At the pre-construction meeting, Awarded Prime Contractor shall bring the executed electronic file release form for the original contract documents. The agreement forms can be found at the end of this Section. Upon the Prime Contractor executing and submitting the agreement to the Architect, the Architect will provide the Contractor one (1) electronic copy of the Revit® BIM Model file(s) **at no charge** within five (5) working days. **Note that CAD files associated with the work can be accessed and exported from the model provided to the General Contractor through the use of Revit® software; therefore, individual CAD files will not be provided by the Architect or its consultants**. Files and Formats to be as follows
    a. Civil: Overall master file in AutoCAD format.
        1) Overall site plan with utility and grading information
        2) All details, detail annotation and references are omitted and not part of the AutoCAD file.
    b. Structural: BIM Model (Revit) and associated working plan views.
        1) Plan views contain overall and enlarged plan section view set up of foundation, second floor framing and roof framing only. All plan views contain grids, dimensions and general annotation.
        2) All details, detail annotation and references are omitted and not part of the model file.
    c. Architectural: BIM Model (Revit) and associated working plan views.
        1) Project Specific BIM Dataset will include information pertaining to the Architectural Building Information Model including model(s), schedules, views, sheets, and details.
        2) All “working” views will be omitted and Huckabee title blocks will be replaced with Huckabee CONTRACTOR Title Block

d. Mechanical, Electrical and Plumbing: BIM Model (Revit) and associated working plan views.
   1) Plan views contain overall and enlarged section plan view set up of mechanical, electrical lighting, electrical power and plumbing plans only.
   2) All details, detail annotation and references are omitted and not part of the model file.

e. Technology: BIM Model (Revit) and associated working plan views.
   1) Plan views contain overall and enlarged section plan view set up showing all device locations and general annotation.
   2) All details, detail annotation and references are omitted and not part of the model file.
   3) Electronic files for Technology drawings will only be released to the Prime Contractor but will require signatures from both the Prime Contractor and the Technology Subcontractor on an additional Technology/Security release form.

2. The Revit® file provided to the Awarded Prime Contractor is NOT FOR CONSTRUCTION PURPOSES, but for convenience only. This BIM Model will consist of the original model utilized for base bid. It is the responsibility of the Awarded Prime Contractor to coordinate all accepted alternates, addenda, Requests for Information, Proposal Requests and any other changes realized during construction. The Architect will not provide up-to-date drawings sets or updated BIM Models to the Awarded Prime Contractor unless otherwise stated within the Owner/Architect agreement. If “conformed” documents are required by the Owner/Architect agreement they will be provided in (PDF) Portable Document Format. Conformed Construction Documents are the Construction Documents modified to include any addenda issued during the bidding or negotiation process. The AIA does not use the terms “conform set” or “conformed set” in its documents.
3. TO THE EXTENT CONFORMED CONSTRUCTION DOCUMENTS ARE PROVIDED TO THE CONTRACTOR REGARDING THE PROJECT, THE FOLLOWING PROVISIONS SHALL APPLY:
   a. The Conformed Construction Documents and related information contained therein, are provided for the Contractor’s (CONTRACTOR) convenience only, and does not relieve the CONTRACTOR from the requirements of Contract Documents which were issued for bid including any addenda. Specifically, to the extent that any discrepancy or conflict exists between the Issue for Bid documents including any Addenda (collectively referred to as the “Bid and Addenda Documents”) on the one hand, and the Conformed Construction Documents on the other, the Bid and Addenda Documents shall control unless otherwise specified in writing by the Architect. Field verification of existing and as-built conditions are required as part of the submittal process as specified in this Section 01 3000 Administrative Requirements and Section 01 7000 Execution and Closeout Requirements.
   b. CONTRACTOR shall not to use such drawings, documents, or other data, in whole or in part, for any purpose or project other than the “PROJECT” in the preparation of shop drawings and other submittals.
   c. CONTRACTOR acknowledges that such drawings, documents, and other data are subject to change or modification. CONTRACTOR shall be responsible for updating any drawings, documents or other data obtained prior to use by them for any purpose.
   d. Any Conformed Construction Documents, including any drawings, documents, or other data related thereto, are provided, “AS IS” without representation or warranty by Architect, either express or implied.

e. CONTRACTOR acknowledges that Conformed Construction Documents are being provided by ARCHITECT as a courtesy to CONTRACTOR, at their specific request, and accordingly CONTRACTOR DOES HEREBY AGREE TO RELEASE, HOLD HARMLESS, DEFEND AND INDEMNIFY ARCHITECT AND THE FORNEY ISD (OWNER), FROM ANY AND ALL CLAIMS, DEMANDS, OR CAUSES OF ACTION, WHICH CONTRACTOR, OR ANY THIRD PARTY, MAY HAVE BY REASON OF ANY INJURY OR DAMAGE SUSTAINED BY CONTRACTOR OR SUCH THIRD PARTTY ARISING OUT OF OR IN ANY WAY RELATED TO THE USE OF SUCH CONFORMED CONSTRUCTION DOCUMENTS.

3.12 PROGRESS PAYMENTS

A. The submission and approval of progress updates and the reports calculating the value of work done for any given pay period for each activity based on the percentage complete for that activity less the amount previously paid for past percentages complete and percent of retainage shall be an integral part and basic element of the application upon which Progress Payments shall be made pursuant to the provisions of the General Conditions and/or Supplementary Conditions. The Contractor shall be entitled to progress payments only as determined from the current updated and approved Construction Schedule. Contractor shall submit (3) three original sets for the first and final applications for payment, with all original signatures of AIA form G702 and G703 (form G702/CMa is not acceptable). All other payment applications shall be submitted electronically as described in paragraph 3.01 Electronic Document Submittal Service.

1. The initial and subsequent cost reports which are developed from the schedule of values shall include the following activity information:
   a. Activity number and activity description.
   b. Percentage of value of work in place against Total Value.
   c. Total cost of each activity.
   d. Value of work in place this period.
   e. Value of work in place to date.
   f. Value of uncompleted work.
   g. Value of stored material not in place.
   h. The cost report will be submitted as supporting documentation to the Contractor’s application for payment. The application for payment shall be submitted as required by the Contract Documents.
   i. Identify scopes of work (campuses/buildings) when applicable with a clear and concise heading.
   j. Separate scopes of work with the appropriate heading per the 2016 MasterFormat standard.
   k. “Description of Work” shall be identified by specification number and heading per 2016 MasterFormat standard while separating the “Labor” and “Material” costs throughout each line item in the scope of Work.
   l. Include all associated contingencies and allowances expenditures.
      1) All contingency and allowance expenditures shall be listed sequentially and follow the same guidelines as noted below. “Description of Work” shall reflect the pricing exercise and identify contingency or allowance.
      2) Reference the example AIA Document G703 found at the end of this Section.
   m. In the event the Work is completed without the use of 100% of the the associated funds in the contract, column "H" or "Balance to Finish" shall represent the total dollar amount being credited back to the owner via AIA G701

3.13 CONTRACTOR’S DAILY FIELD REPORT

A. Daily reports shall be used to record a chronological, day-to-day account of the work force, the respective activities performed, the weather conditions, and any specific events that take place on the Project.

B. The Daily Report shall not be used as a communication tool. Any situations requiring specific action shall be brought to the attention of the appropriate party by means of written correspondence, memoranda, or meeting minutes.

C. Photographs shall be used with the Daily Report to clarify or confirm statements and concerns.

D. The Contractor shall produce a Daily Report including the following information:
   1. Date.
   2. Weather, temperature, wind, and precipitation.
   3. Number of workers on site, listed by Subcontractor and Trade.
   4. Material and equipment deliveries.
   5. Construction quantities placed.
   6. General description of the Work accomplished.
   7. Specific problems encountered.
   8. Meetings held.
   9. List of visitors to the site and their companies.
   10. Construction photographs.

E. NOTE: Provide Owner with copies of signed Daily Report at weekly progress meetings.

3.14 REQUEST FOR INFORMATION

A. Contract document interpretations or clarifications shall be submitted by the Contractor to the Architect in the form of a written request for information (RFI).

B. RFIs shall be numbered sequentially and shall include only one question or related questions per RFI. If the Contractor's question or request for interpretation is already clearly defined or discernible in the contract documents, the RFI may be returned unanswered and the Architect may be entitled to additional compensation (from the Contractor) for review time.

C. If the Contractor believes there may be additional contract cost or time incurred, it shall be stated in the RFI. If additional contract cost or time is required based on the RFI, the Architect will issue appropriate documentation for the proposed change. All changes in work shall be accomplished by approved change order only.

D. The Architect will respond to the RFI in a reasonable and timely manner, within approximately seven (7) business days from the date the RFI is received and stamped by the Architect's office. No extension of contract cost or time will be allowed due to a delayed RFI submittal or the response to an RFI.

3.15 DEVELOPMENT OF ADVERSE WEATHER DATA

A. Unless adverse weather data is defined elsewhere in the contract for construction, provide as follows;

B. Collection of Adverse Weather Data
   1. Weather data obtained from the National Oceanic and Atmospheric Administration (NOAA) shall form the baseline for estimating anticipated delays and project durations and determining the occurrence of unusually severe weather. Data shall be collected and compiled as follows:
      a. Contractor shall compile the number of days per month that the anticipated weather is expected to be adverse by analysis of NOAA. The last 5 years of consecutive data shall be used to establish the baseline of rain days per month associated with the project schedule duration. However, in the absence of 5 years of data, a shorter period may be used.
      b. <u>The compiled data shall be submitted with the Contractors Construction Schedule for documenting future weather events.</u>
   2. Adverse Weather is defined as the occurrence of one or more of the following conditions within a twenty-four (24) hour day that prevents the Critical Path of construction activity exposed to weather conditions or access to the site:

a. Precipitation (rain, snow, or ice) in excess of one-quarter inch (0.25") liquid measure.
b. Temperatures that do not rise above that required for the day's construction activity, if such temperature requirement is specified or accepted as standard industry practice.
c. Sustained wind in excess of twenty-five (25) m.p.h.
d. Contractor shall take into account that certain construction activities are more affected by adverse weather and seasonal conditions than other activities, and that "dry-out" or "mud" days are not eligible to be counted as Weather Delay Day until the standard baseline is exceeded. Hence, Contractor should allow for an appropriate number of additional days associated with the Standard Baseline days in which such applicable construction activities are expected to be prevented and suspended.

3. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the contractor's scheduled work day and Critical Path construction activities were included in the day's schedule, including a weekend day or holiday if Contractor has scheduled construction activity that day.

C. Submission for Time Extension
1. Although the contractor is required to document the occurrence and effect of adverse weather on the work, it does not relieve the Contractor/Architect of its responsibility to investigate and determine if an excusable delay has occurred.
2. The schedule of anticipated adverse weather delays included in the contract is established in work days. Similarly, actual weather data should be collected and recorded on a work day basis. Monthly summaries should be maintained indicating actual adverse weather conditions and the impact on work activities.
3. To determine if any particular month experienced unusually severe weather, the number of actual adverse delay days is compared to that as provided by the NOAA database. If the number of actual delay days is greater than that in the contract the contractor has experienced unusually severe weather.
4. THE DETERMINATION THAT UNUSUALLY SEVERE WEATHER OCCURRED DOES NOT AUTOMATICALLY MEAN THAT THE CONTRACTOR RECEIVES A TIME EXTENSION FOR THE DIFFERENCE OF DAYS BETWEEN THE ANTICIPATED AND ACTUAL ADVERSE WEATHER DELAY DAYS. Further analysis is necessary to determine if the unusually severe weather delayed work activities critical to contract completion. The contractor's progress schedule must be evaluated to make this determination. If it is found that unusually severe weather delayed the contract, a contract modification shall be issued pursuant to Gov. Code 2269
5. Claims for increase in the contract time shall set forth in writing the detail noting the circumstances that form the basis for the claim, the date upon which each cause of delay began to affect the progress of the work, the date upon which each cause of delay ceased to affect the progress of the work and the number of days increase in the contract time claimed as a consequence of each such cause of delay. The Contractor shall bear the entire economic risk of all weather delays and disruptions, and shall not be entitled to any increase in the Contract Price by reason of such delays or disruptions. Requests for an extension of time pursuant to this Subparagraph shall be submitted to the Architect in writing not later than the fifteenth (15th) day of the month following the month during which the delays or disruptions occurred, and shall include documentation demonstrating the nature and duration of the delays or disruptions. Where appropriate, a revised construction schedule indicating all the activities affected by the circumstances shall be included with the documentation.

END OF SECTION

Huckabee

a MORE group brand

ELECTRONIC DOCUMENT RELEASE FORM

Date	

Transmitting Party	Huckabee
Address	801 Cherry Street, Suite 500, Fort Worth, Texas 76102
Phone	888.801.6673
Representative	

Receiving Party	
Address	
Phone	
Representative	

Project Name	
Project Number	

The purpose of this Agreement is to grant a license from Huckabee, henceforth referred to as the Transmitting Party to the Receiving Party for the Receiving Party's use of Digital Data on the Project, and to set forth the license terms. The Receiving Party acknowledges the following:

Article 1 General Provisions

- For the purposes of this Agreement, the term Digital Data is defined to include only those items identified in Article 3 in accordance with the terms and conditions set forth in this Agreement.
- The Digital Data is provided as is, in the native format used by the Transmitting Party. By transmitting the Digital Data, the Transmitting Party makes no warranty, representation, or guaranty that the information provided therein is complete, accurate or compatible with the Receiving Party's software and hardware systems.
- The Digital Data, and the information contained therein is provided "as is" for the Receiving Party as a convenience only The Digital Data is not a Contract Document and shall not be solely relied upon by the Receiving Party for any purpose.
- The Receiving Party shall keep the Digital Data strictly confidential and shall not disclose it to any other person or entity except as set forth in Section 5.
- The Receiving Party may disclose the Digital Data as required by law or court order. The Receiving Party may also disclose the Digital Data to its employees, consultants, or contractors to perform services or work solely and exclusively for the Project, provided those employees,

consultants and contractors are subject to the restrictions on the disclosure and use of Digital Data as set forth in this Agreement.

- To the fullest extent permitted by law, the Receiving Party shall indemnify and defend the Transmitting Party from and against all claims arising from or related to the Receiving Party's modification to, or unlicensed use of, the Digital Data.
- This Hold Harmless Agreement shall be attached to and transmitted with the Transmitted Digital Data at all times so that those that the Receiving Party allows to have access are bound by the terms of this Agreement.

Article 2 License Conditions

Receiving Party has requested that it be provided with Digital Data for the Receiving Party's use(s) solely on this project, the Transmitting Party agrees to provide Digital Data to support the following (check all that apply):

- ☐ Construction
- ☐ Clash Detection
- ☐ Timeline Simulation
- ☐ Logistics Planning
- ☐ Quantity Extraction / Cost Estimating
- ☐ Shop Drawings
- ☐ Bidding
- ☐ Other

Article 3 Digital Data

- ☐ Revit (.rvt) File Name
- ☐ Navisworks (.nwc/.nwd/.nwf) File Name
- ☐ AutoCAD (.dwg) File Name File Name
- ☐ IFC (enter format type) File Name
- ☐ Design Review (.dwf) File Name
- ☐ Other

Accepted:

_____

Signature and Printed Name of Transmitting Party DATE

_____

Signature and Printed Name of Receiving Party DATE

CONTINUATION SHEET

AIA DOCUMENT G703

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

PROJECT NAME:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
	Division 01 — General Requirements								
	General Conditions & Staff	$0.00	$0.00	$0.00	$0.00	$0.00	#DIV/0!	$0.00	$0.00
1	Payment & Performance Bonds					$0.00	#DIV/0!	$0.00	$0.00
2	Etc.					$0.00	#DIV/0!	$0.00	$0.00
	Building 1								
	Division 2 - Existing Conditions								
	02 4100-Demolition - Labor					$0.00	#DIV/0!	$0.00	$0.00
11	02 4100-Demolition - Material					$0.00	#DIV/0!	$0.00	$0.00
12	Etc.					$0.00	#DIV/0!	$0.00	$0.00
	Division 3 - Concrete								
	03 1000-Concrete Forming and Accessories - Labor					$0.00	#DIV/0!	$0.00	$0.00
21	03 1000-Concrete Forming and Accessories - Material					$0.00	#DIV/0!	$0.00	$0.00
22	Etc.					$0.00	#DIV/0!	$0.00	$0.00
	Include all associated divisions, continue sequentially								
	Contingency Expenditures								
61	PR#001 City Comments - Allowance					$0.00	#DIV/0!	$0.00	$0.00
62	PR#002 Storm Water Relocate - Contingency					$0.00	#DIV/0!	$0.00	$0.00
	Building 2								
	Division 2 - Existing Conditions								
88	02 4100-Demolition					$0.00	#DIV/0!	$0.00	$0.00
	Complete additional lines per scope					$0.00	#DIV/0!	$0.00	$0.00
	Contingency Expenditures								
167	PR#021 Additional Marker Boards - Allowance					$0.00	#DIV/0!	$0.00	$0.00
						$0.00	$0.00	$0.00	
	GRAND TOTALS	$0.00	$0.00	$0.00	$0.00	$0.00	#DIV/0!	$0.00	$0.00

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 RELATED SECTIONS

A. Section 01 1000 - Summary of Work.

1.03 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2016.

1.04 SUBMITTALS

A. Within 14 days after date established in Notice to Proceed, submit preliminary schedule defining planned operations.

B. If preliminary schedule requires revision after review, submit revised schedule within 7 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

G. Submit under transmittal letter form specified in Section 01 3000 - Administrative Requirements

H. Approval by the Owner and Owner's Representatives of the Contractor's Construction Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the Work within each and every Contract-required Milestone and Completion date. Omissions and errors in the approved Construction Schedule shall not excuse performance, which is not in compliance with the Contract. Approval by the Owner and Owner's Representatives in no way makes the Owner or Owner's Representatives an insurer of the Construction Schedule's success or liable for time or cost overruns flowing from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of Owner or Owner's Representatives approval of or acquiescence to the Construction Schedule.

I. It is to be expressly understood and agreed by the Contractor that the schedule is an estimate to be revised from time to time as progress proceeds, and that the Owner does not guarantee that Contractor can start work activities on the early or late start dates or complete work activities on the early finish or late finish date shown in the schedule, or as same may be updated or revised; nor does the Owner or Owner's Representative guarantee that Contractor can proceed at all times in the sequence established by said schedule. If Contractor's schedule indicates that Owner or a separate contractor is to perform an activity by a specific date, or within a certain duration, Owner or any separate contractor under contract with Owner shall not be bound to said date or duration unless Owner expressly and specifically agrees, in writing, to same; the Owner's and / or the Owner's Representative's overall review and approval or acceptance of the schedule does not constitute an agreement to specific dates, duration or sequences for activities of the Owner or any separate contractor.

1.05 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with three years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: three years minimum experience in using and monitoring CPM schedules on comparable projects.

1.06 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. Diagram Sheet Size: Width required.

C. Sheet Size: Multiples of 8-1/2 x 11 inches.

D. 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. Critical Path Method (CPM) to 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 phases, separate stages or proposed occupancies and other logically grouped activities.

D. Provide sub-schedules for each stage of Work identified in Section 01 1000 - Summary.

E. Include contract milestone dates and completion dates as specified in the contract.

F. Provide sub-schedules to define critical portions of the entire schedule.

G. Include conferences and meetings in schedule.

H. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

I. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

J. Indicate delivery dates for Owner furniture or equipment scheduled for salvage and/or relocation in project.

K. Indicate delivery dates for owner-furnished products and Owner furniture or equipment scheduled for salvage and/or relocation in project.

L. Indicate testing of materials.

M. Indicate activity periods for punch list.

N. Indicate the work to be performed during the facility's scheduled holidays, weekends, or summer recess periods.

O. Coordinate content with schedule of values specified in Section 01 3000.

P. 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.

C. The schedule diagram shall be a time-scaled drawing.

D. The Construction Schedule Detailed Reports, initial submittal and subsequent updates or revisions, shall indicate each of the following:
   1. Description of activity including activity number/numbers.
   2. Estimated duration time or remaining duration for each activity.
   3. Early start date for each activity.
   4. Late start date for each activity.
   5. Early finish date for each activity.
   6. Late finish date for each activity.
   7. Float available for each path of activities containing float.
   8. Actual start date for each activity begun.
   9. Actual finish date for each activity completed.
   10. Identification of all critical path activities in the mathematical analysis.
   11. The critical path for the Project, with said path of activities being clearly and easily recognizable on the time-scaled graphic diagram, and the relationship between all non-critical activities and activities on the critical path shall be clearly shown on the graphic diagram.
   12. The dollar value of each activity in relation to the schedule of values. This may be shown on a separate cost report.
   13. The responsibility code for the Contractor or Subcontractor performing each activity or portion thereof.
   14. The percentage complete of each activity in progress or complete.

3.04 SCHEDULE OF OFF-SITE ACTIVITIES

A. The Contractor shall include in his Construction Schedule all procurement related activities which lead to the delivery of materials to the site in a timely manner. Upon written approval by the Project Manager, these activities may be submitted as a separate Off-Site Activities Schedule, properly correlated to the Construction Schedule. The schedule of off-site activities shall include, but is not limited to, the following:
   1. Dates for submittals, ordering, manufacturing or fabricating, and delivery of equipment and materials. Long lead items requiring more than one month between ordering and delivery to site shall be clearly noted;
   2. All significant activities to be performed by the Contractor during the fabrication and erection/installation in a Contractor's plant or on a job site, including materials/equipment purchasing, delivery; and
   3. Contractor's drawings and submittals to be prepared and submitted to the architect.

B. The Contractor shall be solely responsible for expediting the delivery of all material to be furnished by him so that the construction progress shall be maintained according to the current schedule for the Work.

C. The Owner's Representatives shall be advised, in writing, by the Contractor whenever it is anticipated by the Contractor that the delivery date of any material and/or equipment furnished by the Contractor for installation will be later than the delivery date shown on the schedule, subject to schedule updates.

D. Submittals, equipment orders and similar items are to be treated as schedule activities, and shall be given appropriate activity numbers.

3.05 FLOAT TIME

A. Float or slack time is defined as the amount of time between the earliest start date and the latest start date or between the earliest finish date and the latest finish date of an activity or a chain of activities on the Construction Schedule. Float or slack time is not for the exclusive use or benefit of either the Contractor or the Owner. Contractor's work' shall proceed according to early start dates, and the Owner's Representatives shall have the right to reserve and apportion float time according to the needs of the Project. The Contractor acknowledges and agrees that actual delays, affecting paths of activities containing float time, will not have any affect upon Contract completion times, providing that the actual delay does not exceed the float time associated with those activities.

B. Extensions of time for performance as described in the Contract Documents will be granted only to the extent that time adjustment for the activity or activities affected by any condition or event which entitles the Contractor to a time extension exceed the total float or slack along the path of activities affected at the time of Notice to Proceed of a Change Order or the commencement of any delay or condition for which an adjustment is warranted under the Contract Document.

3.06 SCHEDULE UPDATES AND REPORTS

A. Every month, in conjunction with the monthly application for payment, the Contractor shall submit an updated graphic diagram and an updated detailed schedule report from the Construction Schedule and updated Record Documents. Contractors Application for Payment shall not be approved for payment unless schedule is attached and Record Documents are current. The schedule shall be updated to show actual progress and the effect of delays and other events. The actual start and finish dates shall be included in the detailed report, as well as the actual dates of the Milestone events.

B. The content of the updated Construction Schedule shall be equal to that noted in Section 1.02 Construction Schedule.

C. The updated Construction Schedule submitted by Contractor shall not show a completion date later than the Contract Completion Date, subject to any time extensions approved by Owner.

3.07 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 7 days.

3.08 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. Update 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.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effectincluding the effects of changes on schedules of separate contractors.

3.09 RECOVERY SCHEDULE

A. Should the Contractor's Construction Schedule indicate that the progress of the work is behind schedule to the extent that any of the mandatory specific or milestone dates or completion dates are in jeopardy the Contractor shall be required to, at no extra cost to the Owner, prepare and submit to the Owner's Representatives within 72 hours, a Recovery Plan, in a form and detail appropriate to the need and explain and display how he intends to reschedule those activities to regain compliance with the Construction Schedule.

3.10 SCHEDULE REVISIONS

A. Should the Contractor, after approval of the initial Construction Schedule, desire to change his plan in construction, he shall submit his required revisions to the Owner's Representatives along with a written statement of the revisions including a description of the logic for rescheduling the work, methods of maintaining adherence to intermediate Milestones and Specific Dates and the reasons for the revisions. The Contractor shall revise his schedule to include the effect of changes, acts of God, and other conditions or events, which have affected the Schedule. If the requested changes are acceptable to the Owner and Owner's Representatives, the changes will be incorporated into the Construction Schedule in the next reporting period.

B. When the Owner orders changes by change Order which have the potential to impact the Contract Milestones or Specific Dates stipulated in the Supplemental Conditions, a Schedule will be prepared by the Contractor and provided to the Owner's Representatives for concurrence or revision. After the proposed schedule revision has been mutually agreed upon, it will be incorporated into the Construction Schedule. Change Order logic will affect only those activities and performance data directly concerned. Adjustments in Scheduled intermediate Completion Dates or for the Contract as a whole will be considered only to the extent that there is insufficient remaining float to absorb these changes.

C. Any change to the approved Construction Schedule must be approved, in writing, by the Owner and Contractor.

D. Neither the updating or revision of Contractor's Construction Schedule nor the submission, updating, change or revision of any report or schedule submitted to Owner's Representatives by Contractor under this Section nor Owner's review or non-objection of any such report or schedule shall have the effect of amending or modifying, in any way, the Contract Time, any Contract Completion Date, or Contract Milestone Dates or of modifying or limiting in any way Contractor's obligations under this Contract.

3.11 REQUESTED TIME ADJUSTMENT SCHEDULE

A. The updated Construction Schedule submitted by Contractor shall not show a completion date later then the Contract Time, subject to any time extensions approved by Owner:

1. Provided, however, that if Contractor believes he is entitled to an extension of the Contract Time under the Contract Documents, Contractor shall submit to Owner's Representatives, with each progress payment update, a separate schedule analysis (entitled "Requested Time Adjustment Schedule") indicating suggested adjustments in the Contract Time which should, in the opinion of Contractor, be made in accordance with the Contract Documents by time extension, due to changes, delays or conditions occurring during the past month or previously, or which are expected or contemplated by Contractor (whether such conditions are excusable under the Contract or are alleged to be due to Contractor or Owner fault); this separate schedule, if submitted, shall be time-scaled utilizing a computer generated and computer-drawn Schedule analysis schedule, unless otherwise approved by the Owner's Representative and shall be accompanied or preceded by a formal time extension request as required by the Contract and a detailed narrative justifying the time extension requested.

B. The time extension request shall include schedule forecasts that predict the actual Project Completion Date, and any separable portions thereof specified by Owner plus a forecast of the actual achievement of any milestones listed in the Owner-Contractor Agreement.

C. To the extent any time extension requests are ending at the time of any update in the Construction Schedule, the “Requested Time Adjustment Schedule” shall also be updated each month, to reflect any adjustments made by Contractor in the logic, sequence or duration of any activities in the Construction Schedule, or any time extensions previously granted by Owner, and to reflect actual or expected progress, in order that the “Requested Time Adjustment Schedule” shall clearly and accurately reflect Contractor’s Actual intention and proposed time adjustments as of the latest update.

D. Neither the Owner, the Project Manager or the Architect shall have any obligation to consider any time extension request unless the requirements of the Contract Documents, and specifically, but not limited to these requirements, are complied with; and Owner shall not be responsible or liable to Contractor for any constructive acceleration due to failure of Owner to grant time extensions under the Contract Documents should Contractor fail to substantially comply with the submission requirements and the justification requirements of this Contract for time extension requested. Contractor’s failure to perform in accordance with the Construction Schedule shall not be excused, nor be chargeable to Owner, because Contractor has submitted time extension requests or the "Requested Time Adjustment Schedule”.

3.12 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 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Contractor's construction-related professional design services.

F. Contractor's design-related professional design services.

G. Control of installation.

H. Mock-ups.

I. Tolerances.

J. Manufacturers' field services.

K. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 3132 - Geotechnical Data

B. Section 01 4516 - Contractor Quality Control. Testing and Inspection services.

C. Section 01 4533 - Code-Required Quality Control.

1.03 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations.

1.04 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.
   1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.

1.05 SUBMITTALS

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

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in Texas.
   1. The General Contractor or Construction Manager shall comply with the Texas Professional Services Procurement Act when selecting an Engineer for Delegated Design Services.

1.07 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.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in specification Section 01 4516 - Contractor's Quality Control and Section 01 4533 - Code-Required Quality Control.

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 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Make corrections as necessary until Architect's approval is issued.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

3.03 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.

3.04 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 of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
   1. Observer subject to approval of Architect.
   2. Observer subject to approval of Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect and Owner, it is not practical to remove and replace the Work, Owner will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY OF REFERENCE STANDARDS

A. Related Documents: General and Supplementary Conditions of the Contract, Division 01 General Requirements, and Drawings are applicable to this Section.

B. Section Includes, but is not limited to:
   1. Permits and fees.
   2. Code and regulatory compliance for the associated Work.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements.

1.03 PERMITS AND FEES

A. The Owner will pay for all City and/or State Building Permits, Impact Fees, and other Building Fees related to the project. The Contractor and Subcontractors will be responsible for obtaining all required trade permits or license fees.

B. Once General Contractor is in possession of the final construction permits (building permits), Contractor shall be responsible for submitting to the AHJ, approved request for pricing (RFP), change orders, or other documents that contain significant changes to the contract until construction is complete. Contractor shall pay for permits or fees associated with any required changes.

1.04 BUILDING CODES

A. Building Code Compliance: Reference drawings for year editions used in document design.
   1. Building Code – International Building Code
   2. Plumbing Code – International Plumbing Code
   3. Mechanical Code – International Mechanical Code
   4. Electrical Code – National Electrical Code
   5. Life Safety Code – NFPA 101

B. ICC/NSSA Standard for the Design and Construction of Storm Shelters:
   1. ICC 500-2014 American National Standard

C. Energy Code Compliance
   1. Energy Code – International Energy Code.
   2. Contractor shall provide, at the jobsite office, one copy of the completed energy code review.

D. Accessibility Compliance
   1. Accessibility requirements are from the 2012 ADA Standards for Accessible Design, and the 2012 Texas Accessibility Standards of the Architectural Barriers Act.
   2. The information contained in this section is provided to identify the modifications provided for users who are not served by adult standards. It shall be the Contractors responsibility to be familiar with the standards and to apply the standards to all aspects of the project. Any apparent conflict between current standards and the drawings shall be brought to the architect's attention for clarification. The information in the drawings does not release the contractor from full compliance with the latest TAS requirements.

3. Contractor shall provide, at the jobsite office, one copy of the 2012 Texas Accessibility Standard (TAS) regulations as prepared by the Texas Department of Licensing and Regulation, concerning handicap accessibility. The Contractor shall conform to the regulations as set forth in the TAS. Copies can be obtained at Texas Department of Licensing and Regulation, P.O. Box 12157, Austin, TX; 512-539-5669 / Fax 512-539-5690; www.license.state.tx.us. Copies may be downloaded from http://www.license.state.tx.us/ab/abtas.htm.
4. Federal Register:
    a. Vol. 56, No. 144, July 26, 1991, Rules and Regulations; Appendix A to part 36 – Standards for Accessible Design.
    b. 5 U.S.C. 552(a) and 1 C.F.R. part 51, Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Building Elements Designed for Children's Use.
5. Texas Accessibility Standards
    a. The Elimination of Architectural Barriers Texas Government Code, Chapter 469, effective March 15, 2012.

1.05 ACCESSIBILITY REQUIREMENTS

A. General
1. All general TAS standards apply and staff-use areas and spaces for the use of students above the age of 12 shall be designed for adult users. In facilities for younger students, adult-use spaces will commonly be identified by their name (MEN, WOMEN, STAFF TLT, etc). Juvenile-use spaces will be likewise identified (BOYS, GIRLS, STU TLT, etc.).
2. Besides the transition to adult dimensions for students above the age of 12, some requirements vary additionally, depending on age. Refer to the tables enclosed for the varying heights and spacing required.
3. Age/Grade ranges are interpreted as follows:
    a. Ages 3 years and 4 years / Pre-Kindergarten
    b. Ages 5 years thru 8 years / Kindergarten thru 3rd Grade
    c. Ages 9 years thru 12 years / 4th Grade thru 7th Grade
    d. Over 12 years / 8th Grade thru Adult

B. Dimensional Tolerances
1. Contractor is reminded that while the TAS guidelines allow for "construction and manufacturing tolerances" there is no "definition" of what that tolerance is, therefore, where TAS gives a single absolute dimension, every effort should be made to equal that dimension. Where TAS provides a dimensional range, or a minimum or a maximum, there is NO construction tolerance. Any dimension less than the minimum or more than the maximum will be rejected upon inspection and subject to correction.

1.06 QUALITY ASSURANCE

A. Contractor's Designer Qualifications: Refer to Section - 01 4000 - Quality Requirements.

B. ICC 500-2014 Compliance: Each contractor responsible for the construction of a main wind-force resisting system or any component thereof, shall submit a written statement of responsibility to the authority having jurisdiction, the responsible design professional and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain:
1. Acknowledgement of awareness of the special requirements contained in the quality assurance plan.
2. Acknowledgement that control will be exercised to obtain compliance with the construction documents.
3. Procedures for exercising control within the contractors organization, the method and frequency of reporting and the distribution of reports.

4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

PART 2 PRODUCTS

2.01 GENERAL

A. Contractor shall note that no regulatory agency designates products with a formal “ADA Approved” designation. Contractor shall be responsible for ensuring all products are reviewed for accessibility compliance.

PART 3 EXECUTION

3.01 REPAIR

A. Non-Compliant Work
   1. The Contractor shall be responsible for removing and correcting all work that is found to be in non-compliance.
   2. The Contractor shall perform all work at no expense to the Owner.
   3. The Contractor shall be responsible to perform all repairs regardless of the date at which the non-compliant items are found.

B. The work shall be performed such that there will be no disruption to the Owner schedule.

END OF SECTION

SECTION 01 4516
CONTRACTOR'S QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control of installation.

B. Testing and inspection services by one or more quality assurance laboratories to be employed by the Contractor (if these services are not provided by subcontractors or material suppliers). The purpose of quality assurance services are so that the Contractor can verify work is done properly during construction, before the Contractor requests that the Owner's Independent Quality Control Agency performs code-required special inspections, tests and structural observations. The Contractor's QA Laboratory testing and inspection services shall include, but not be limited to:
   1. Testing, inspection, and certifications specified in sections of Project Manual other than Section 01 4533. This quality assurance testing shall be paid by the Contractor.
   2. Earthwork borrow pit material verification
   3. Concrete mix design verification
   4. Masonry unit compressive strength verification
   5. Structural Steel quality assurance recommended by AISC
   6. HVAC Testing and Balancing
   7. Indoor Air Quality Testing
   8. Certification of No Asbestos Containing Materials

C. References and standards.

D. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

A. Document 00 3132 - Geotechnical Data

B. Section 01 3000 - Administrative Requirements: Submittal procedures.

C. Section 01 4000 - Quality Requirements

D. Section 01 4533 - Code Required Quality Control

E. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2014a.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.

G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2010.

1.04 QUALITY ASSURANCE (OF CONTRACTOR'S QUALITY ASSURANCE LABORATORY)

A. Contractor's QA Laboratory Qualifications and Procedures:

1. Meet "Recommended Requirements for Independent Laboratory Qualification," latest edition published by American Council of Independent Laboratories. Testing agencies shall meet the requirements of ASTM E 329, "Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction" and ASTM E 543, "Determining the Qualification of Nondestructive Testing Agencies."
2. The inspection and testing services of the testing agency shall be under the direction of a Registered Engineer licensed in the State of Texas, charged with engineering managerial responsibility, and having at least five years engineering experience in inspection and testing of construction materials.
3. Inspecting personnel monitoring concrete work shall be ACI certified inspectors.
4. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection. Include memorandum of remedies of deficiencies reported by this inspection.
5. Testing Equipment: Calibrated at reasonable intervals by devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
6. Tests and inspections shall be conducted in accordance with specified requirements and if not specified, in accordance with applicable standards of the American Society for Testing and Materials and other recognized authorities as approved.
7. Primary inspectors performing structural steel inspection shall be currently certified AWS Certified Welding Inspectors (CWI), in accordance with the provisions of AWS QCI, "Standard and Guide for Qualification and Certification of Welding Inspectors." The inspector may be supported by assistant inspectors who may perform specific inspection functions under the supervision of the inspector. Assistant inspectors shall be currently certified AWS Certified Associate Welding Inspectors (CAWI). The work of assistant inspectors shall be regularly monitored by the inspector, generally on a daily basis.

1.05 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. Conform to 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 the 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. See Section 01 4000 - Quality Requirements

3.02 GENERAL REQUIREMENTS FOR CONTRACTOR'S LABORATORY SERVICES

A. The Contractor shall perform various tests as required in the various specification sections for conference to the construction documents other than those in Section 01 4533. The Owner maintains the right to verify the test results with an independent testing lab.

B. Contractor's design testing and certification testing includes:
   1. Testing defined in this Specification Section.
   2. Testing when source of material is changed after initial tests have been performed.
   3. Other testing required by other Sections of the Specifications.

3.03 EARTHWORK

A. Earthwork: Identify suitable material at borrow material location, sampling soil material, and testing of soil material samples.

3.04 DRILLED PIERS

A. The Contractor shall provide all equipment, materials and labor required for the Test Pier Holes specified in Section 31 6329.

3.05 ACIP PILES

A. The Contractor shall provide all equipment, materials and labor required for any ACIP Pile Load Tests specified in Section 31 6316.

3.06 CONCRETE

A. Furnish concrete mix designs, in accordance with ACI 301, Section 3.9, made by an independent testing laboratory or qualified concrete supplier. Where mix designs by an independent testing laboratory are required, the laboratory shall be selected by the Contractor, approved by the Architect, and paid by the Contractor.

3.07 MASONRY

A. Furnish laboratory testing from the manufacturer or a Contractor-hired laboratory that verifies the compressive strengths of masonry units comply with specifications.

B. Absorption Tests:
   1. Perform a field of test for water absorption on three representative clay units and at least once for each 5,000 square feet of wall before laying.
   2. The field test shall consist of drawing a one inch diameter circle with a wax pencil (the diameter of a quarter). Place thirty (30) drops of water from a medicine dropper in rapid succession with the circle. If all of the water is absorbed into the brick in less than 60 seconds, the units shall be deemed "to dry" and shall be prewetted.

3.08 STRUCTURAL STEEL

A. Provide current welder certifications for each welder to be employed.

B. Performing certified welding procedure qualification and re-qualification testing specified in Section 05 1200, 05 2100, 05 3100, 05 4000, 05 4400, 05 5000 and 13 3419 and as recommended by the American Welding Society.

C. Testing of materials when mill certificates are unavailable.

3.09 HVAC TESTING AND BALANCING

A. The Contractor shall provide complete testing and balancing services for all HVAC and control systems to be carried out by an independent certified testing and balancing (TAB) agency under a separate and direct contract with the General Contractor. Scope of testing and balancing services, Contractor obligations, etc. shall be in accordance with Testing, Balancing and Commissioning specification section.

3.10 INDOOR AIR QUALITY TESTING

A. The Contractor shall provide complete air quality testing services for the project to be carried out by an independent certified agency under a separate and direct contract with the General Contractor. Scope of testing services, Contractor obligations, etc. shall be in accordance with Section 01 5721 – Indoor Air Quality Requirements.

3.11 CERTIFICATION OF NO ASBESTOS CONTAINING MATERIAL

A. The Contractor shall provide the Architect a written certification of the following;
   1. Hazardous material-free construction – certify that no asbestos containing material was used and/or incorporated into the project during construction.
   2. The statement shall be as follows:
      a. The undersigned, pursuant to the General and Supplementary Conditions of the Contract for Construction, hereby certifies that to the best of his/her knowledge, information and belief, the materials incorporated into the project and as used during the construction process are free of any type of asbestos material, lead, polychlorinated biphenyl (PCB) or other materials identified by governmental agencies as being hazardous.

3.12 MANUFACTURERS' FIELD SERVICES

A. See Section 01 4000 - Quality Requirements

3.13 DEFECT ASSESSMENT:

A. See Section 01 4000 - Quality Requirements

END OF SECTION

SECTION 01 4533
CODE-REQUIRED QUALITY CONTROL

PART 1 GENERAL

1.01 IMPORTANT NOTE FOR ALL PLAN REVIEWERS (AHJ) TO READ BEFORE ISSUING A BUILDING PERMIT!

A. This Section (Specification Section 01 4533) is the "Statement of Special Inspections, Testing, Structural Observations and Commissioning" for this project and is hereby submitted to the building official for review and approval. This statement has been prepared collaboratively by the Architect and appropriate Design Professionals such that the registered design professional responsible for the design of each portion of the work considered the requirements of Chapter 17 of the International Building Code (IBC), considered the Commissioning requirements of the International Energy Conservation Code, considered the nature of the work, and then customized this statement specifically for this project based on their professional opinion of what they recommend for the code-required quality control plan. In some instances, the special inspections, testing and/or structural observation required by this statement are significantly less than the special inspections, testing and/or structural observations that would be required by the IBC without Exception #1 in IBC Section 1704.2 which states special inspections, tests, and/or structural observations are not required for construction as warranted by conditions in the jurisdiction as approved by the building official. This customized quality control plan also includes some variations from procedures required by IBC Chapter 17, such as submitting certain items to Registered Design Professionals in lieu of the AHJ; these variations are based on procedures that AHJ's have indicated are preferred and also the experience of the Registered Design Professionals which indicates that this quality control plan (including these procedural variations) will meet or exceed the local standard of care. It is our understanding that the AHJ has the authority to allow these procedural variations on code-required quality control because the AHJ has the authority to waive the entire quality control plan under Exception #1 in IBC Section 1704.2. According to IBC Section 105.3.1, "If the application or the construction documents do not conform to the requirements of pertinent laws, the building official shall reject such application in writing, stating the reasons therefor. If the building official is satisfied that the proposed work conforms to the requirements of this code and laws and ordinances applicable thereto, the building official shall issue a permit therefor as soon as practicable." Therefore, if a building permit is issued without written notification that this statement or a portion thereof is rejected, it will be understood that this Statement of Special Inspections, Testing, Structural Observations and Commissioning is acceptable in the opinion of the building official, who has the authority to render interpretations of the code according to IBC Section 104. For clarification, this Statement includes the information required by IBC Section 1704.5 to be submitted to the AHJ before commencement of structural observations.

B. Chapter 17 of the International Building Code requires that the AHJ approve Special Inspection and Testing Agency (SITA) staff qualifications and requires that discrepancies identified during construction be resolved in order to comply with the building code. Based on Huckabee's experience with numerous AHJ's, it is understood that, instead of the AHJ directly reviewing these qualifications and resolutions, it is acceptable to the AHJ for Registered Design Professionals to determine whether or not SITA staff qualifications are acceptable and determine what resolutions to discrepancies identified during construction comply with the building code, without soliciting the opinion of the AHJ. And, for clarification, some discrepancies that occur during construction often include scenarios in which the specified scope for a quality control agency was not performed due to the Owner not hiring an agency to do some portion of the scope, inaction by the Contractor, inaction by the hired quality control agency or a miscommunication between parties. Therefore, it shall be considered acceptable for the Registered Design Professionals for each respective design discipline to be considered the sole determinant of acceptable quality control agency qualifications and resolutions of discrepancies and not report these details to the AHJ, if a building permit is issued without written notification that this understanding is incorrect.

1.02 OWNER-PREPARED DOCUMENTS

A. Sections 01 1400 and 01 4533 require that the Owner participate in the preparation of certain documents (e.g. Owner Agreement with the SITA) before critical construction schedule milestones. Proposers shall assume for proposal purposes that the Owner will provide these documents or provide all necessary participation of these documents without causing a delay to the construction schedule. However, the Contractor shall notify the Owner in writing 45 days before such a document is necessary to avoid a delay, notifying the Owner in writing of the deadline necessary to avoid a delay.

1.03 REQUIREMENTS FOR QUALITY CONTROL

A. Requirements for Quality Control:
   1. Special inspections and testing services shall be provided by an agency to be selected and employed by the Owner, which is referred to herein as the Special Inspection and Testing Agency (SITA). The SITA may subcontract other firms to provide quality control services on behalf of the SITA as necessary; however, the SITA shall be responsible for providing directly or indirectly all of the SITA responsibilities defined in Section 01 4533.
   2. Commissioning services shall be performed by the Commissioning Agent (CxA) as specified in Division 01 and Divisions 22-26.
   3. Code-Required Structural Observations shall be performed by the Structural Engineer of Record or another person he or she considers to be qualified to perform the observations. The Structural Engineer of Record may subcontract other firms to provide structural observation services, if desired.
   4. As a general part of the Code-Required quality control plan, Design Professionals shall be notified at appropriate times and allowed to make site visits and visual observations for general conformance with the contract documents.
   5. It shall not be required to notify and obtain approval from the AHJ if alternative arrangements are made in hiring firm(s) to provide quality assurance services (e.g. Owner hiring multiple firms, Architect acting as the Owner's Agent and hiring the SITA, Owner hiring the Structural Observer, etc…)
   6. Each type of quality control service shall be considered separate from every other type of quality control service. The services by one quality control firm do not relieve the responsibility of the other quality control firm to provide their quality control services.

1.04 RELATED REQUIREMENTS

A. Document 00 3132 - Geotechnical Data

B. Section 01 1400 - Work Restrictions: Work restrictions related to quality assurance.

C. Section 01 3000 - Administrative Requirements: Submittal procedures.

D. Section 01 4000 - Quality Requirements.

1.05 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): The agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located. Where the term "building official" is used, it shall refer to the AHJ

B. Code or Building Code: 2015 Edition of the International Building Code and documents referenced by that document.

C. Commissioning Agent (CxA): The agent specified to perform the Commissioning specified in Division 01 and Divisions 22-26.

D. Design Professionals: For the purposes of Section 01 4533, the term “Design Professionals” shall refer to every Design Professional responsible for the design, or making recommendations regarding the design, of any portion of the project, including but not limited to the Geotechnical Engineer, professionals that sealed drawings on the Contract Documents, as well as any professionals hired by the Contractor. (Examples on some projects may be the Geotechnical Engineer, Architect, Civil Engineer, Structural Engineer, Mechanical Engineer, Electrical Engineer, Contractor’s Cold Formed Metal Framing Engineer, Contractor’s Pre-Manufactured Canopy Engineer, Contractor’s Pre-Engineered Metal Building Engineer, Contractor’s Precast Concrete Engineer, etc…)

E. Special Inspection and Testing Agency (SITA): The agencies responsible for providing all required special inspections and testing defined by Section 01 4533.
   1. Where used in the contract documents, the following terms (if used) shall also refer to the Special Inspection and Testing Agency (SITA):
      a. "Special Inspection Agency"
      b. "Construction Materials Engineering Firm"
      c. "Construction Materials Testing Firm"
      d. "Owner's Testing Laboratory"
      e. "Independent Testing Laboratory"

F. Special Inspections and Tests: The Special Inspections and Tests for this project are the inspections and tests required by Section 01 4533. These special inspections and tests are independent of any inspections and tests conducted directly by Forney ISD or Contractor.

G. Structural Observations: The Code-Required Structural Observations for this project are the structural observations required by Section 01 4533. Any other observations of the structural systems, or “structural observations”, for this project are not Code-Required Structural Observations.

H. Quality control observations: For the purposes of Section 01 4533, the term “quality control observations” shall refer to the observations by the following quality control personnel:
   1. CxA
   2. Code-Required Structural Observer
   3. Design Professionals

I. Quality control observers: For the purposes of Section 01 4533, the term “quality control observers” shall refer to the personnel acting on behalf of the firms providing quality control observations.

J. Quality control personnel: For the purposes of Section 01 4533, the term “quality control personnel” shall refer to the personnel acting on behalf of the following as they perform quality control services associated with Section 01 4533:
   1. SITA
   2. CxA

3. Code-Required Structural Observer
4. Design Professionals

K. Quality control services: For the purposes of Section 01 4533, the term “quality control services” shall refer to the services required by Section 01 4533 to be performed by the quality control personnel.

1.06 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary ; 2011.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement ; 2015.

C. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field ; 2012.

D. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete ; 2010.

E. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel ; 2008.

F. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel ; 2011.

G. IAS AC89 - Accreditation Criteria for Testing Laboratories ; 2010.

H. IAS AC291 - Accreditation Criteria for Special Inspection Agencies ; 2012.

I. AASHTO R18 - Accreditation for Materials Testing Laboratories

1.07 APPROVAL OF SITA QUALIFICATIONS AND SCOPE

A. SITA Qualifications: Before performing any SITA services on this project, the SITA shall submit to the Architect a statement for approval by the Architect indicating that the SITA firm and SITA Staff that will be assigned to this project will meet the following qualifications. The SITA shall indicate the years of experience performing similar work if a listed certification is not held by any proposed personnel (e.g. “We will only assign staff to this project that meets the listed certifications in Section 01 4533 with the exception that our masonry inspection and testing personnel have at least 10 years of experience performing masonry inspection and testing on similar projects but do not have a TMS Certification”):

1. It shall be required that the Special Inspections and Testing Agency (SITA) be accredited by IAS according to IAS AC291 and IAS AC89, or be accredited by AASHTO (or AMRL) unless the SITA obtains written approval of their experience performing inspection and testing services on similar projects by the Architect.
2. It shall be required that the Construction Materials Engineer be a Professional Engineer with Construction Materials Engineering experience that is licensed in the State of Texas.
3. It shall be required that the Concrete Inspection Technicians be at least certified ACI (American Concrete Institute) Concrete Field Testing Technicians-Level I, unless the SITA obtains written approval of the technician's experience performing concrete inspection services on similar projects by the Structural Engineer.
4. It shall be required that the Concrete Testing Technicians be at least certified ACI (American Concrete Institute) Concrete Laboratory Testing Technicians-Level I, unless the SITA obtains written approval of the technician's experience performing concrete testing services on similar projects by the Structural Engineer.
5. It shall be required that the Masonry Inspection Technicians be at least certified TMS (The Masonry Society) or ACI (American Concrete Institute) Masonry Field Testing Technicians unless the SITA obtains written approval of the technician's experience performing masonry inspection services on similar projects by the Structural Engineer.
6. It shall be required that the Masonry Testing Technicians be at least certified TMS (The Masonry Society) or ACI (American Concrete Institute) Masonry Laboratory Testing Technicians unless the SITA obtains written approval of the technician's experience performing masonry testing services on similar projects by the Structural Engineer.

7. It shall be required that the Steel Inspection and Testing Technicians (for both Structural Steel Framing as well as Cold Formed Metal Framing) be certified Associate Welding Inspectors as defined by AWS (American Welding Society) or have a higher certification by AWS unless the SITA obtains written approval of their experience performing inspection and testing services on similar projects by the Structural Engineer.
    a. Steel Inspection Technicians shall have passed within the last 2 years an eye examination with or without corrective lenses to verify the Technician has near vision acuity of Snellen English or equivalent at no less than 12 inches, and far vision acuity of 20/40 or better.
    b. Steel Inspection Technicians inspecting bolts shall have a minimum 2 years of experience inspecting bolts as part of regular inspections of structural steel systems.
    c. Steel Testing Technicians performing non-destructive testing of welds other than visual shall be certified NDT Level II Technicians in accordance with the American Society for Nondestructive Testing Recommended Practice No. SNT-TC-1A.
8. It shall be required that the individual(s) performing special inspection services regarding storm doors and storm shutters (which are to be impact protective systems for the Tornado Shelter) shall have a certificate indicating he or she has successfully completed a hardware installation course on the specific storm doors and storm shutters from the manufacturer of each such system that the Contractor installs. In addition, the individual(s) shall meet one of the following qualifications:
    a. have experience on a minimum of 2 projects performing installations on the systems to be installed,
    b. have experience on a minimum of 2 projects performing inspection services for the systems to be installed, or
    c. be a Professional Engineer licensed in the State of Texas.
9. It shall be required that the individual(s) performing special inspection services regarding storm louvers (which are to be impact protective systems for the Tornado Shelter) shall have a certificate indicating he or she has successfully completed a hardware installation course on the specific storm doors and storm shutters from the manufacturer of each such system that the Contractor installs. In addition, the individual(s) shall meet one of the following qualifications:
    a. have experience on a minimum of 2 projects performing installations on the systems to be installed,
    b. have experience on a minimum of 2 projects performing inspection services for the systems to be installed, or
    c. be a Professional Engineer licensed in the State of Texas.
10. It shall be required that the Technician providing special inspection services regarding firestopping at penetrations and joints be an IFC-Certified Inspector with a complete certificate indicating that the technician has passed the online exam and has complete the hands-on product training from at least four (4) firestop product manufacturers, or have written approval by the Architect of experience performing similar inspection services. It shall be permitted for “similar inspection” to be inspection of sprayed fire-resistant material if this experience is supplemented by a certificate or card indicating the technician has completed manufacturer’s training on the firestopping material submitted and approved for use on this project.

B. SITA Scope: Before performing any SITA services on this project, the SITA shall submit to the Architect a statement (e.g. a copy of a fully executed agreement between the Owner and the SITA, or an email from the Construction Materials Engineer to the Architect) for approval by the Architect, indicating that the SITA will perform all work specified in Section 01 4533 to be performed by the SITA. An example of an acceptable statement is, “Our firm will provide all work specified in Section 01 4533 to be performed by the SITA for the [insert project name] located at [insert project address], Huckabee project number [insert project number].”

C. It shall be permitted for the SITA to provide one statement regarding both qualifications and scope.

1.08 APPROVAL OF CXA QUALIFICATIONS AND SCOPE

A. CxA Qualifications: Before performing any CxA services on this project, the CxA shall submit to the Mechanical and Electrical Engineers a statement for approval by the Mechanical and Electrical Engineers indicating that the CxA firm and CxA Staff that will be assigned to this project will meet the qualifications required by Division 01 and Divisions 22-26.

B. CxA Scope: Before performing any CxA services on this project, the CxA shall submit to the Mechanical and Electrical Engineers a statement (e.g. a copy of a fully executed agreement, or an email from the CxA) for approval by the Mechanical and Electrical Engineers, indicating that the CxA will perform all work specified in Division 01, Section 01 4533 and Divisions 22-26 to be performed by the CxA. An example of an acceptable statement is, “Our firm will provide all work specified in Division 01, Section 01 4533 and Divisions 22-26 to be performed by the CxA for the [insert project name] located at [insert project address], Huckabee project number [insert project number].”

C. It shall be permitted for the CxA to provide one statement regarding both qualifications and scope.

1.09 CONTRACTOR’S GENERAL RESPONSIBILITIES

A. It shall be the Contractor’s sole responsibility to comply with all requirements of the Contract Documents, without relying on any of the quality control services required by Section 01 4533. The purpose of quality control services is to simply provide some verification that the Contractor is complying with the Contract Documents.

B. As required by the International Building Code, the Contractor shall submit to Forney ISD, the Building Official (AHJ), and the Architect a written "Acknowledgement of Contractor's Responsibilities Related to Code-Required Quality Control".
   1. This statement shall identify this project as " Project Title", including Architect's project number.
   2. The statement shall either include the following language or similar language: "As the Construction Firm responsible for the construction of this project, we acknowledge that we are aware of all the requirements of Specification Sections 01 1400 and 01 4533. In addition, we acknowledge that all firms currently under contract as Subcontractors to our firm on this project are also aware of the requirements of Specification Sections 01 1400 and 01 4533. We further acknowledge that we will make any firms we contract with in the future for this project also aware of these requirements prior to commencement of their scope of work."

C. If any steel fabrication occurs off-site (at a fabrication shop) that is not an AISC certified fabrication shop, the Steel Fabricator shall pay for the SITA to perform the special inspections or testing required by Section 01 4533 for all such off-site steel fabrication.

D. The Contractor shall notify quality control personnel at least five (5) business days before they need to visit the site to perform their services. In addition, the Contractor shall cooperate with quality control personnel, provide incidental labor, equipment and facilities to give them access to the work (including ladders and lifts), and provide space onsite for their operations and storage.
   1. If the Contractor does not request quality control services where required, the work that was not inspected, tested, and/or observed, shall be considered deficient and the Contractor shall issue an RFI to the Architect immediately when the Contractor becomes aware of this deficiency.

E. The Contractor shall make accessible and visible all work requiring quality control services until all deficiencies are corrected or otherwise fully addressed.

F. Addressing Deficiencies in SITA Reports: The Contractor shall fully address all deficiencies noted by the SITA and notify the SITA when and how each deficiency was addressed. It shall be permitted to either correct the work in the presence of the SITA, provide evidence to the SITA that there was in fact no deficiency if that is the case, provide evidence to the SITA that the appropriate Design Professional(s) have determined that the deficiency from the contract documents is acceptable, or provide evidence to the quality control entity (e.g. SITA, CxA, or the respective design professional) that a remediation plan was approved by the appropriate Design Professional(s) and then constructed.

G. Addressing Quality Control Observations:
   1. The Contractor shall be responsible for addressing any observations verbally noted by Design Professionals during site visits as if these observations were noted in writing. If the Contractor would like a written record of those observations, the Contractor shall submit a record of their understanding of the conversation to the Architect and Design Professional.
   2. The Contractor shall be responsible for determining if any observations identify or provide evidence of any deficiencies (discrepancies from the contract documents).
   3. All deficiencies associated with observations by Design Professionals shall be addressed by the Contractor.
   4. Except for items noted by a Design Professional that are identified in an observation report as “registered”, the Contractor is not required to notify the Design Professional when deficiencies that are associated with observations by Design Professionals have been addressed in good faith by the Contractor. It shall be acceptable for the Contractor to address such items by correcting the discrepancy from the contract documents or determining that a deficiency does not in fact exist. Alternatively, it shall also be acceptable for the Contractor to issue an RFI proposing acceptance of the deficiency or a remediation, and then remediating if approved.
      a. If the Design Professional requests at any time written correspondence that the Contractor has addressed deficiencies associated with any or all observations, the Contractor shall determine whether or not such deficiencies were addressed, resolve any deficiencies that were in fact not yet addressed, and then provide written correspondence indicating that all deficiencies associated with observations by the Design Professional have been corrected when all deficiencies have been corrected.
   5. The Contractor shall correct or otherwise fully address all items noted by Design Professionals that are identified in an observation report as “registered”. After registered items have been corrected or otherwise fully addressed but before the Contractor is permitted to install construction which obstructs view of the correction or noted condition, the Contractor shall submit to the Design Professional acceptable evidence of how the item was addressed. The Design Professional shall be the sole determinant of what is considered acceptable evidence and the Design Professional may require a follow-up site visit to make observations. Examples of acceptable evidence might be a photograph emailed by the Contractor, a report from the SITA, or a conversation with the Architect’s representative.

H. If deficiencies are brought to the Contractor's attention by quality control personnel, the Contractor shall issue a Request For Information (RFI) to the Architect if direction is needed to resolve the item. This RFI shall include the Contractor's suggested course of action to address the deficiency. Unless the Contractor completely removes nonconforming work and replaces it with conforming work, it is the Contractor's responsibility to hire design professionals as required to design any remediation preferred by the Contractor, to be submitted to the Architect for consideration. This RFI may also include a request for acceptance of the deficiency based on an evaluation by the appropriate project design professional(s) such as the Structural Engineer of Record. The entire cost and schedule impact of any deficiencies identified by inspections, tests and/or structural observations shall completely be the responsibility of the Contractor, at no additional cost to Forney ISD. Forney ISD reserves the right to assess liquidated damages associated with any and all delays due to addressing deficiencies.
   1. If the Contractor would like Design Professional(s) such as the Structural Engineer of Record to design a remediation in lieu of the Contractor hiring design professionals, it shall be permitted for the Contractor to make this request in the RFI. However, project design professional(s) shall have no obligation to design any remediation and shall be permitted to charge for design services. The Contractor shall provide a deadline for the requested design in the RFI, or it may be assumed that the schedule of this resolution is not time-sensitive. If the project design professional(s) do not produce an approved remediation design by this deadline (even if there is no response to the RFI), the Contractor shall either remove nonconforming work and replace it with conforming work or hire design professionals to design a preferred remediation to be submitted for consideration by the Architect. The Contractor shall be responsible for any delays due to attempts by project design professional(s) to design remediation's by the requested deadline.

I. The Contractor shall pay for all re-inspections, re-tests and re-observations performed after quality control personnel have identified deficiencies, regardless of who is paying for the basic quality control services. The Contractor shall also pay for any tests, inspections and/or observations not required by Section 01 4533 but requested by the Contractor.

J. The Contractor shall be responsible for paying (either directly or by reimbursing the Owner or Architect) for all additional services by quality control personnel associated with addressing deficiencies.
   1. Design Professionals shall be permitted to bill the Contractor at their standard hourly rates and it shall be the Contractor's responsibility to realize that the Contractor shall be responsible for paying for any time a Design Professional spends performing additional services such as responding to RFI's regarding deficiencies, attending meetings regarding deficiencies, making site visits to address deficiencies.
   2. In general, many Design Professionals do not charge for these services; however, on this project, Design Professionals shall be permitted to bill or not bill the Contractor at their discretion and the Contractor shall be required to pay all such bills.
   3. Design Professionals are not obligated to inform the Contractor in advance what that Design Professional's standard hourly rates are or how much time will be spent or even whether or not that Design Professional intends to submit a bill; the Contractor shall be obligated to ask Design Professionals how much time a task may take and otherwise keep track of these items if the Contractor desires to consider hiring a different Design Professional to assist them in addressing deficiencies.
   4. These additional services are often short duration items scattered over a long period of time; the Design Professionals shall be permitted to send the Contractor a bill for all services associated with addressing deficiencies at the end of the project before a Certificate of Final Completion is issued. The Owner shall be permitted to pay for these services out of the Contractor's Retainage.

1.10 SITA'S GENERAL DUTIES AND RESPONSIBILITIES

A. Role: The Special Inspection and Testing Agency (SITA) shall provide Construction Materials Engineering services, with a Construction Materials Engineer that directly supervises all SITA responsibilities and evaluates whether or not reports from inspections and/or tests conform with construction requirements in the drawings and specifications related to the specific inspections and/or tests required by Section 01 4533.
   1. It shall be the Contractor's sole responsibility to comply with all requirements of the Contract Documents, without relying on any of these quality control services. The purpose of the quality control services provided by the SITA is to simply provide some verification that the Contractor is complying with the Contract Documents.
   2. For clarification, acting under the supervision of the SITA's Construction Materials Engineer, the SITA's personnel shall be permitted to use judgment and experience when measuring dimensions and locations of elements where required by this specification section, to verify conformance with the design intent rather than measuring all instances. For example, where Section 01 4533 requires that the SITA verify locations and or dimensions of all elements for a certain type of construction, it shall be acceptable for the SITA personnel to field measure only a fraction of those dimensions (e.g. "random sampling") when non-measured conditions visually appear to conform, measuring at a frequency determined by the SITA to be appropriate using judgment and experience (rather than field measuring every dimension). Furthermore, the SITA may increase or decrease the frequency of these field measurements depending on how often deficiencies are encountered.
   3. The SITA shall not be permitted to release, revoke, alter, or enlarge on any requirements of Contract Documents; approve or accept any portion of the work; or, assume any duties of the Contractor. The SITA shall not have the authority to stop the work.

B. Contractor's Work Restrictions: The Work Restrictions in Section 01 1400 related to Quality Control require that the Contractor obtain certain documents from the SITA and host certain meeting that the SITA attends, before certain construction milestones for the project to proceed. The SITA shall cooperate with the Contractor, providing those items and attending those meetings within a reasonable time frame.

C. Pre-Construction Meetings: The SITA shall participate (in person or on the phone) at the Foundation Pre-Construction Meeting, Quality Control Pre-Construction Meeting, and Framing Pre-Construction Meeting.

D. SITA Reports: After each special inspection or test, the SITA shall issue a report electronically to the Architect, Contractor, and the Design Professional requiring the report (e.g. concrete cylinder test reports for the foundation shall be submitted to the Structural Engineer), and anyone else the Architect indicates should be included in the distribution (e.g. AHJ, Owner, Construction Observer, etc…). These reports shall include the project title and number and information deemed appropriate by the Construction Materials Engineer.

E. Addressing Deficiencies:
   1. The SITA shall notify the Architect, Contractor and the Design Professional requiring the quality control, of observed deficiencies or non-conformance of work or products.
      a. A draft report of any deficiencies noted during inspections shall be provided to the Contractor on-site in writing (using the method(s) previously agreed to with the Contractor) before the special inspector leaves the site that day.
      b. A final report of inspections shall be issued within five (5) business days of on-site visits. A report of tests performed shall be issued within five (5) business days of performing tests.

2. Re-inspection and/or re-testing required because of Contractor's non-conformance to the Contract Documents shall be performed by the SITA and shall be paid for by the Contractor. In the event that this occurs, the SITA shall invoice the Contractor directly unless the Owner has indicated it is acceptable to simply bill the Owner and make note that the Owner should be reimbursed for the additional services.

F. The SITA shall provide appropriate quality control staff on-site within five (5) business days of any request by the Contractor to perform inspections and tests required by Specification Section 01 4533, including any re-inspections, retests and/or repeat structural observations.
   1. The Contractor shall be responsible for requesting all site visits necessary for the SITA to perform all quality control services.
   2. If the Contractor does not request inspection, testing, and/or structural observation where required, the work that was not inspected, tested, and/or observed, shall be considered deficient.

G. The SITA shall issue a report to the Architect, Structural Engineer and Contractor if inspection and/or testing indicates that work conforms or does not conform with the contract documents.
   1. If work that is required to be inspected or tested is covered or made permanently inaccessible by the Contractor prior to inspection or testing by the SITA, it shall be assumed that the covered work is non-conforming.

H. The SITA shall comply with the requirements for issuing a Final Report of Special Inspections and Testing required by Section 01 4533.

1.11 QUALITY CONTROL OBSERVATIONS

A. General
   1. The Contractor shall notify every quality control observer (e.g. the CxA and every Design Professional) at least five (5) business days before project conditions are ready for every site visit to make observations that those individuals would like to make.
   2. Quality control observers shall be permitted to issue a written observation report or simply note items verbally in a conversation with any representative of the Contractor onsite. The Architect and/or the Contractor may request written observation reports; however, each Design Professional shall be the sole determinant of if or when written observation reports are issued.

B. Schedule of Site Visits
   1. Code-Required Structural Observations shall occur as required by other portions of Section 01 4533. (The Contractor does not need to ask when these observations shall be required.)
   2. Before the Quality Control Pre-Construction Meeting, the Contractor shall request from the CxA and every Design Professional a description of project conditions which are associated with every desired site visit. (For example, the Structural Engineer may indicate that after rebar is installed for the first grade beam pour but before concrete is poured, he or she would like to send an Engineer-In-Training or an Observer to the site to make observations.)

C. Scope of Observations
   1. Site visits desired by Design Professionals but not specifically listed as required in Section 01 4533 are not code-required site visits (e.g. Structural Observations from regular visits by the Structural Engineer or his/her representatives are not the Code-Required Structural Observations listed in other portions of Section 01 4533).
   2. The observations are visual observations by the Design Professional, or their representative, of the systems which were designed by the Design Professional and are under construction or were recently constructed, for some verification that this work general conforms to the approved construction documents.

3. The determination of which conditions to note during observation shall be made at the sole discretion of the Design Professional or their representative. These observations may be limited to clear indications noted in which the observer believes the Contractor misunderstood the design intent and the misunderstanding is about a significant requirement. The Design Professional shall not be responsible for identifying any and all significant deficiencies.
4. In written observation reports, the Design Professional shall be permitted to identify certain conditions as “registered” (e.g. registered deficiency, registered observation, registered item, etc…) at the Design Professional’s discretion. The Contractor shall fully address all items noted, regardless of whether they are noted as registered or not; however, the Contractor shall provide the Design Professional with evidence that registered items have been fully addressed and ask the Design Professional if that evidence is sufficient, which provides a higher level of quality control.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 QUALITY CONTROL PRE-CONSTRUCTION MEETING

A. The Contractor shall schedule a "Quality Control Pre-Construction Meeting" with the SITA’s Construction Materials Engineer, CxA, Code-Required Structural Observer, Structural Engineer, and the Architect’s Construction Observer. Before scheduling the meeting, the Contractor shall ask the Owner if a representative of the Owner would like to attend. It shall be permitted for people to attend in person or by conference call. During this meeting:
   1. The Contractor shall review the approval status of the qualifications and scope statements from the SITA and CxA with all attendees.
   2. The Contractor shall acknowledge their responsibility to request site visits for all inspections, tests, and structural observations required by Specification Section 01 4533 before work is made inaccessible or covered. The Contractor shall also acknowledge their responsibility to address all deficiencies.
   3. The Contractor, SITA, CxA and Code-Required Structural Observer shall acknowledge their responsibilities to comply with the requirements for Final Reports of Quality Control from firms providing quality control service in Section 01 4533.
   4. The Contractor shall provide the construction schedule to all attendees. If this schedule changes during construction, the Contractor shall notify quality control personnel.
   5. The SITA, CxA and Code-Required Structural Observer shall summarize their understanding of how Specification Sections 01 1400 and 01 4533 shall be applied to this project.
   6. The Contractor shall summarize their understanding of when the Contractor is required to request SITA, CxA, Code-Required Structural Observation and Design Professional site visits for inspections, tests and/or structural observations.
   7. The Architect’s Construction Observer shall determine if the site visits described for Design Professionals hired by the Architect generally comply with the Owner-Architect Agreement.
   8. The Contractor shall acknowledge their obligation to notify Design Professionals how observations are addressed when observations are noted on reports as “registered”.
   9. The Contractor and SITA and shall determine collaboratively with each other a mutually agreed upon method for SITA technicians to provide the Contractor with written draft reports of any deficiencies before the technician or structural observer leaves the site on the day the deficiencies are observed. This method shall not require Contractor's staff to be on-site to receive this draft report. As an example, this could include emailing a specified Contractor email address from smart phones or placing a hard copy of reports in a specified Contractor box outside the job trailer.

10. The SITA, CxA and Code-Required Structural Observer shall each determine collaboratively with the Contractor when the last report from each firm (regarding any portion of the project) is likely to be issued.

3.02 QUALITY CONTROL SPECIFIED BY THE DESIGN PROFESSIONALS

A. Within 7 days after the Foundation Pre-Construction Meeting, the Contractor shall notify the SITA of any special inspections and testing required by delegated design professionals. The SITA shall perform all quality control required by each delegated design professional (hired by the Contractor) to be performed by the SITA. The delegated design professionals shall require quality control that they, in their professional opinion, believe appropriate for the SITA to perform given the nature of the work with consideration given to their understanding of the local industry standard of care. Proposers (potential Contractors) shall assume for proposal purposes that each delegated design professional will require the full scope of special inspections and testing (and structural observation if applicable) listed in the material specific sections and tables of Chapter 17 of the IBC unless told otherwise by the delegated design professional before Proposers submit proposals.

B. Where special inspection and testing is specified by other design professionals (e.g. Architect, Structural Engineer, Civil Engineer, MEP Engineer, etc…) to be performed by the SITA for delegated design items, this work shall be performed at a minimum but shall not be a substitute for the quality control program required by the delegated design professional.

3.03 QUALITY CONTROL SPECIFIED BY THE STRUCTURAL ENGINEER

A. Scope: The quality control required by the Structural Engineer shall apply to all work sealed by the Structural Engineer of Record, the individual who sealed the “S” Sheets.

B. Special Inspections for Soils
   1. Reference SITA Scope on the Drawing Sheets: The SITA shall perform special inspection and testing of the soil below the carton void forms and the subgrade in the crawlspace as indicated on the "S" sheets, with utility trench backfill as required by the Mechanical and Electrical Engineers on the MEP Drawing sheets as well as the Technology Consultant on the Technology Drawing sheets.
   2. Coordination with the Geotechnical Engineer: The SITA shall coordinate inspections and testing of soil with observations by the Geotechnical Engineer, regardless of whether the Geotechnical Engineering Firm is the same firm or a different firm from the SITA firm. The Contractor shall contact the Geotechnical Engineer before the Quality Control Pre-Construction Meeting to determine when the Geotechnical Engineer recommends observations and communicate the schedule on these Geotechnical observations to the SITA. The Contractor shall then notify the Geotechnical Engineer at the appropriate times so that the Geotechnical Engineer can make observations onsite. Where the Geotechnical Engineer recommends that the Geotechnical Engineer be onsite to confirm items (e.g. appropriate depth of a strata, appropriate condition of a strata, anticipated subsurface water conditions, etc…), the SITA shall not perform inspections and testing associated with those items until the Geotechnical Engineer has made such observations.

C. Deep Foundation Elements and Footings

1. The SITA shall observe the installation of all deep foundation elements and/or footings and record all information necessary for the SITA to provide a reliable cost reconciliation by linear foot for each type of deep foundation element and cubic yard of excavation and reinforced concrete for footings. This information shall include the elevation of the grade at the time of drilling, which the SITA may obtain from the Contractor. This information shall also include the elevation of the the bottom of steel casing (or depth below grade at a known elevation), when casing is used. The SITA shall be the sole determinant in the field, for each deep foundation element and for all footings, when sufficient bearing material has been reached and the SITA shall identify for the Contractor, during drilling/excavation, the highest elevations that the SITA considers acceptable so as to assist the Contractor in minimizing work (especially work associated with a unit price adjustment). The SITA shall be the sole determinant in the field, for each deep foundation element, when casing is required and the SITA shall identify for the Contractor, during drilling, the fewest piers the SITA considers necessary to case and the highest elevations that the SITA considers acceptable for the bottom of casing at each pier so as to assist the Contractor in minimizing work (especially work associated with a unit price adjustment).
2. After the Contractor indicates that the last Deep Foundation Element has been installed, the Contractor shall request a Deep Foundation Element Reconciliation Report from the SITA. The SITA shall then provide a tabulation of the difference between assumed and actual conditions for the total cumulative length of uncased deep foundation elements, and cased piers where applicable, for each diameter and reinforcement pattern. The Contractor shall then calculate the change in cost associated with the Pier Reconciliation Report from the SITA and then submit a Request for Information, asking the Architect and any appropriate Design Professionals to review the report and proposed cost change before a Proposed Cost Revision is submitted.

D. Special Inspections and testing for Augered cast-in-place (ACIP) piles
1. The SITA shall perform the following quality control services related to the ACIP pile load tests specified in Section 31 6316 which shall be performed before the installation of any piles other than load test piles:
    a. Before installation of any ACIP Piles for load testing purposes, the SITA shall verify that the Geotechnical Engineer has approved in writing the quality assurance load testing program proposed by the Contractor. The SITA shall not be responsible for load testing installation and instrumentation.
    b. During installation of piles for load testing purposes, the SITA shall perform inspection and testing services for the test piles as required for all piles. If requested by the Contractor in an attempt to expedite the construction schedule, the SITA shall be permitted to test (at no cost to the Contractor) additional mortar cubes at dates requested by the Contractor.
    c. ACIP Pile Load tests may be performed when the grout is at least 7 days old or when the average grout strength of 3 prisms has an average compressive strength that is at least 2,000 psi. The SITA shall obtain and test one set of 3 grout prisms to be tested at 7 days. The Contractor has the option to pay the SITA directly for additional grout prisms if it is desired to have additional testing performed earlier than 7 days.
    d. During the load testing procedure (incremental loading and unloading), the SITA shall perform inspection services and record the load and displacement data as well as the time this data was recorded for each incremental loading and unloading.
    e. The SITA shall issue a report of the pile load tests (e.g. pile characteristics to be recorded for all piles, load-displacement data and any concerns regarding pile installation or capacity). The SITA shall issue this report to the Contractor, Architect and Structural Engineer within two (2) business day of the Contractor completing pile load tests.

2. A representative of the SITA shall make continuous inspections to determine that the specified pile lengths are obtained.
3. SITA shall furnish complete pile log showing the diameter, top elevation of each pile, reinforcing steel cage length, quantity and size of bars, total depth of pile.
4. Each day of pumping grout, one set of 6 mortar cubes shall be prepared by the testing laboratory with 2 tested at 7 days, 2 tested at 28 days, and 2 held in reserve. At the Contractor's expense, the Contractor has the option to test additional cubes at any time to test them at earlier ages.

E. Special Inspections and Testing for Concrete Construction
1. Before requesting that SITA personnel visit the site to make inspections of concrete work, the Contractor shall electronically send to the SITA any applicable reinforcement shop drawings and concrete mix design submittals that have been reviewed by the specifying Engineering Firm. The Contractor shall give the SITA sufficient time and lighting at the site, as deemed necessary by the SITA, to perform the specified inspections and testing.
2. Inspection and Testing at Precast Structural Concrete (PSC) Fabrication Shops:
   a. Where PSC fabrication of structural load-bearing and debris-impact-resistant components and assemblies for the Tornado Shelter (precast wall panels, precast double tees, etc.) is performed off-site, regardless of the certification of the Precast Concrete Fabricator, the SITA shall perform the full scope of cast-in-place concrete special inspections and testing at the fabricator's shop as required by this specification section. It shall be the PSC fabricator's responsibility to communicate to the Contractor when the SITA is to be notified for inspections in the shop. The PSC fabricator shall pay for the SITA to perform the special inspections and testing required by this specification section.
   b. Where PSC fabrication of components not related to a Tornado shelter is performed off-site, and the PSC Fabricator shop is not certified by the Precast Concrete Institute (PCI) or by both the Construction Certification Institute (CCI) and the National Precast Concrete Association (NPCA), the PSC Fabricator shall pay for the SITA to perform the special inspections and/or testing required by this specification section for all such PSC fabrication. The Contractor shall notify the SITA when fabrication of PSC is scheduled to begin at these facilities. The SITA shall visit these facilities at the beginning of work within those facilities and review the quality assurance / quality control documentation at that facility (e.g. processes, welder certifications, logs of inspections, etc.). The SITA staff, acting under the direct supervision of the Construction Materials Engineer, shall then determine how much (if any) of the specified inspections and/or testing for on-site cast-in-place concrete construction shall apply to the off-site shop construction and then perform that scope of work after communicating to the Contractor when the SITA is to be notified for inspections at the shop. For proposal purposes, PSC Fabricators without PCI or both CCI and NPCA certifications shall assume that the SITA staff will required the full scope of inspection and testing for on-site cast-in-place concrete construction for PSC construction. Note, special inspections and testing beyond the quality control provided by the fabrication shops for PSC Fabricators with PCI or both CCI and NPCA certifications are not required to be performed by the SITA.
3. The SITA shall provide the following inspections and testing for concrete construction.

a. Before every concrete pour (generally the same day of the pour unless the SITA deems the scope of the pour to be too large), the SITA shall visit the site and inspect the reinforcement for conformance with the reviewed shop drawings, to the extent that the SITA deems appropriate under the supervision of the Construction Materials Engineer (e.g. yield strength, size, spacing, concrete cover, etc…at a random sampling to be determined by the SITA). While onsite, the SITA shall be empowered but shall not be obligated to make comments and/or ask questions during inspections regarding related conditions, including but not limited to anchor bolt embedment, steel embed plate type and location, formwork, concrete accessories, debris, etc….
b. During concrete pours, for each intended use (e.g. footing, grade beam, interior slab on grade, etc…), the SITA shall sample concrete from the first concrete truck on each day of concrete pouring and shall determine which other concrete trucks they will sample each day, if any. The SITA shall, however, sample trucks so that no more than 150 cubic yards of concrete is placed at a time without being sampled (e.g. sampling every 150 cubic yards). While onsite, the SITA shall be empowered but shall not be obligated to make comments during inspections regarding related conditions, including but not limited to unsafe conditions, age of concrete in trucks after batching before poured, vibration of concrete, hot weather and cold weather concrete placement methods, temperature and wind speed for the pour that day, and curing conditions for previously poured areas.
c. For each truck that is sampled, the SITA shall do the following and notify the Contractor immediately of any deficiencies so that the Contractor has an opportunity to address those deficiencies:
    1) Collect a copy of the batch ticket and verify that the mix design matches the reviewed submittal for the intended use;
    2) Collect a sample in accordance with ASTM C172.
    3) Perform a slump test in accordance with ASTM C172 and verify that the slump is within the range on the submittal;
    4) Perform an air content test in accordance with ASTM C231or ASTM C173 and verify the air content is within the range on the submittal;
    5) Record the concrete temperature;
    6) Fabricate cylinders molded and standard-cured in accordance with ASTM C31. Each set of cylinders shall consist of either four cylinders that are 6” in diameter and 12” tall or five cylinders that are 4” in diameter and 8’ tall. The Contractor shall be responsible for providing a portion of the site to the SITA for cylinder storage; however, the proper temperature and humidity of curing of all test cylinders and protection of curing on the jobsite shall be the responsibility of the SITA and not the Contractor. The SITA shall also be responsible for transportation from the field to the laboratory. All test cylinders shall be stored in the field 24 hours and then be carefully transported to the laboratory and cured in accordance with ASTM C31.
    7) The Contractor shall have the option to pay the SITA to perform additional inspections and testing, such as additional concrete cylinders whenever desired to determine early strengths. The Contractor shall be responsible for any additional cylinders required to comply with OSHA requirements.
d. or each set of concrete cylinders fabricated, the SITA shall perform compression strength testing in accordance with ASTM C 39 with one (1) cylinder at 7 days and either two (2) 6” diameter cylinders or three (3) 4” diameter cylinders at 28 days. The SITA shall hold one cylinder in reserve and test the reserve cylinder at 56 days only if the average of the 28 day cylinder strengths is below the specified strength and the specifying Engineer indicates it is acceptable to test at 56 days rather than waiting a longer period of time.

4. All post-installed anchors installed in the Tornado Shelter as part of a load bearing or impact resistant assembly (louver attachment, shelter door attachment, embed plates, etc.) shall be continuously inspected by the SITA. The Inspector shall perform continuous inspections to verify the following:
    a. Compliance with the Manufacturer's Printed Installation Instructions (MPII).
    b. Anchors have been installed in accordance with minimum age of concrete and concrete temperature range noted in the Structural Drawings.
    c. Anchor diameter, length, and grade are in accordance with the Contract Documents.
    d. Location and spacing of anchors are in accordance with the Contract Documents.
    e. Installation of adhesive anchors horizontally or upwardly inclined to support sustained tensions are performed by personnel certified by an applicable certification program (certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchor Installer Certification program or equivalent).

F. Code-Required Structural Observation for Precast Panel installation
    1. The Structural Engineer of Record, or another Professional Engineer licensed in the State of Texas acting as a Structural Observer on behalf of the Structural Engineer of Record, shall make structural observations during the installation of precast concrete wall panels. The Contractor shall not be permitted to demobilize cranes from the site until the Structural Observer has made observations on-site (in case panels need to be removed and reset).

G. Special Inspections and Testing for Masonry Construction
    1. Before requesting that SITA personnel visit the site to make inspections of masonry work, the Contractor shall electronically send to the SITA any applicable reinforcement shop drawings and mortar/grout mix design submittals that have been reviewed by the Structural Engineering Firm. The Contractor shall notify the SITA of the rate of masonry construction as it occurs so that the SITA is onsite the first day of structural masonry work and no more than 5,000 square foot of structural masonry is constructed at a time without the SITA being onsite for inspections and testing (e.g. notifying the SITA every 5,000 square feet). The Contractor shall also coordinate the SITA site visits such that structural masonry work is occurring (e.g. masons are installing masonry) when the SITA is performing inspections and tests. Structural masonry for the purposes of quality control is hereby defined as all reinforced concrete masonry walls which are exterior walls and load-bearing walls.
    2. The SITA shall provide the following inspections and testing for masonry construction:
        a. The first day of masonry work, the SITA shall observe the mason mixing the first batches of both mortar and grout, verifying the following (with the mason preparing a batch of mortar or grout for inspection purposes only, to be discarded, if no mortar or grout is needed that day):
            1) the ingredients appear to be consistent with the reviewed mix submittals (e.g. the type of cementitious materials listed on bags appear correct);
            2) the volumetric proportions are consistent with the reviewed mix submittals; and,
            3) containers with known volume are used when batching (allowing the mason to assume that a bag of cement weighing at least 92 pounds is a cubic foot), verifying that shovels are not used when proportioning sand or gravel.
        b. At every visit for inspections and testing of masonry construction, the SITA shall do the following:
            1) Inspect bedjoint reinforcement and vertical as well as horizontal conventional reinforcement where work is exposed (i.e. constructed but not obstructed from view with grout or masonry) for conformance with the reviewed shop drawings, to the extent that the SITA deems appropriate under the supervision of the Construction Materials Engineer (e.g. yield strength, size, spacing, masonry cover, etc…at a random sampling to be determined by the SITA);

2) Inspect grout spaces to verify they are clear of debris;
3) Sample grout and fabricate a set of three (3) grout prisms (grout only, formed with CMU on all sides, and not a masonry prism which is constructed with two units and a mortar joint) and test in the lab at 28 days in accordance with ASTM C 1019. The Contractor shall be responsible for providing a portion of the site to the SITA for prism storage; however, the proper temperature and humidity of curing of all test prisms and protection of curing on the jobsite shall be the responsibility of the SITA and not the Contractor. The SITA shall also be responsible for transportation from the field to the laboratory.
   (a) every time grout is sampled to make prisms, the SITA shall perform a slump test and verify that the slump is greater than 8”.
4) While onsite, the SITA shall be empowered but shall not be obligated to make comments and/or ask questions during inspections regarding related conditions, including but not limited to use of integral water repellant in mortar mixes where specified, mortar mixing, grout mixing, grouting where post-installed anchors will be required, anchor bolt embedment of embedded anchor bolts, steel embed plate type and location, masonry accessories, veneer anchors, debris, lift height for grouting, age or segregation of mortar or grout when placed, vibration, hot weather and cold weather practices, material certification for masonry units, proper face-shell bedding, bracing of previously constructed non-loadbearing masonry walls, and curing conditions for previously constructed walls.
5) Mortar cubes and masonry prisms are not required. If the SITA produces mortar cubes or masonry prisms without the Owner's authorization, the Owner will not pay for mortar cube preparation or mortar cube testing. The Contractor shall be permitted to request and pay for mortar cubes or masonry prisms, if the Contractor desires.

H. Structural Observations for Masonry Construction
1. A structural observer shall visit the site and make observations of reinforced concrete masonry unit (CMU) construction before the first grout pour.
2. Before the Contractor begins construction of any masonry that is indicated on the Structural drawings to be a part of or to be within the shelter envelope as defined by G Series Sheets, a Structural Observer shall verify the following:
   a. The masonry subcontractor foreman on-site understands the approved mix design proportions for mortar and grout.
   b. The bags of cementitious materials are labelled and are consistent with the approved mix design for mortar and grout.
   c. Material test reports indicate the masonry unit strengths comply with the contract documents.
3. Before every time the Contractor pours grout of any masonry that is indicated on the Structural drawings to be a part of or to be within the shelter envelope as defined by G Series Sheets, a Structural Observer shall verify the following:
   a. Reinforcement generally conforms with the Structural drawings, including but not limited to rebar sizes, locations and proper splice lengths.
   b. The grout spaces are clear of debris such that the grout coverage of the bars will comply with the project specifications.
   c. Mortar joints extend the full width of the face shells.
   d. The clear dimension between the rough openings of the masonry and any components such as doors, shutters, or storm louvers that penetrate the shelter envelope (as defined by G Series sheets) are within permitted tolerances as indicated by the component manufacturer's instructions. Note that these tolerances are significantly more stringent than conventional ACI tolerances.

I. Special Inspections and Testing for Steel Construction

1. Before requesting that SITA personnel visit the site to make inspections of structural steel work, the Contractor shall electronically send to the SITA copies of the welding certifications for every steel welder that will be onsite, manufacturer certification for every adhesive anchor installer that will be onsite and any applicable structural steel submittals that have been reviewed by the Structural Engineering Firm. Upon receipt of the welding certifications, the SITA Staff shall verify these welders have passed qualification tests with the last year using procedures covered in the American Welding Society "Structural Welding Code - Steel," D1.1, latest version. Upon receipt of the adhesive anchor certifications, the SITA Staff shall verify these installers do not have an expired certification. The inspector (acting under the supervision of the Construction Materials Engineer) shall be permitted to accept alternative experience and/or on site demonstration of competency if qualified in the opinion of the inspector.
2. Inspection and Testing at Non-AISC Fabrication Shops: If any steel fabrication occurs off-site at a fabrication shop that is not an AISC certified fabrication shop (excluding Steel Joist Institute facilities manufacturing steel joists), the Steel Fabricator shall pay for the SITA to perform the special inspections or testing required by Section 01 4533 for all such off-site steel fabrication. The Contractor shall notify the SITA when fabrication of steel is scheduled to begin at these facilities. The SITA shall visit these facilities at the beginning of steel work within those facilities and review the quality assurance / quality control documentation at that facility (e.g. processes, welder certifications, logs of welding inspections, etc…). The SITA Staff, acting under the supervision of the Construction Materials Engineer, shall then determine how much (if any) of the specified inspection and testing for on-site steel construction shall apply to the non-AISC-certified shop construction, and then perform that scope of work after communicating to the Contractor when the SITA is to be notified for inspections at the shop. For proposal purposes, Steel Fabricators with non-AISC shops shall assume that the SITA Staff will require the full scope of inspection and testing for on-site steel construction shall apply to the non-AISC-certified shop construction.
3. On-Site Inspection and Testing: The Contractor shall notify the SITA of the status of steel construction as it occurs so that the SITA is onsite after defined areas of the structural steel portion of the project are complete (with the exception that the SITA must be present during the installation of any overhead adhesive anchors), notifying the SITA of any work within those areas that is to be completed at a later date. The Contractor shall not cover up portions of steel construction until the SITA has performed quality control services without identifying any deficiencies at those areas. By the end of the project, the Contractor shall have scheduled visits from the SITA for steel inspection and testing of all structural steel construction (including all miscellaneous steel members but not including cold formed metal framing) that occurred on-site. During each sitevisit, the SITA shall do the following:
    a. Verify off-site fabrication occurred at an AISC certified fabrication shop (by obtaining a copy of the shop's certificate), unless the SITA has provided the specified inspection and testing services at the fabrication shop.
    b. Structural Steel Members: Verify that the structural steel framing member sizes and locations generally conform to the reviewed steel submittals.
    c. Welds that are not Full Penetration welds: Out of all the welds in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which welds to visually inspect (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall inspect at least 10% of each type of weld. The SITA shall be permitted to inspect up to 100% of each type of weld if the SITA Staff believe appropriate, based on the conditions observed. The Contractor shall clean all welds identified for visual inspection by the SITA. Visual inspection of welds shall include but not be limited to alignment of members, weld size, length, location, weld/base-metal fusion and signs of cracking.
    d. Welds that are Full Penetration welds:

1) the Contractor shall clean all full-penetration welds. The SITA Staff shall visually inspect all full-penetration welds.
2) out of all the full-penetration welds in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which welds receive Ultrasonic Testing (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall perform Ultrasonic Testing on at least 10% of each type of full-penetration weld (e.g. normal full-penetration, flare vee, etc…). The SITA shall be permitted to perform Ultrasonic Testing on up to 100% of each type of full-penetration weld if the SITA Staff believe appropriate, based on the conditions observed.

e. Bolts:
1) Load-Indicator Type Bolts: Out of all the load-indicator bolts in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which load-indicator bolts receive inspection and testing (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall visually inspect at least 10% of each type of load-indicator bolt. The SITA shall be permitted to visually inspect up to 100% of the load-indicator bolts if the SITA Staff believe appropriate, based on the conditions observed. Visual inspection and testing of load-indicator bolts shall include verification that the grade, diameter, location, and minimum length generally conform with the reviewed steel submittals, and that the splines have been snapped off to indicate proper torquing. If any steel to steel connections do not utilize load-indicator type bolts, this section shall apply.
2) Anchor Bolts that are not Overhead Adhesive Anchor Bolts: Out of all the anchor bolts (including base plate anchor bolts, expansion bolts, and adhesive anchor bolts but excluding overhead adhesive anchor bolts) in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which anchor bolts receive inspection and testing (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall visually inspect at least 10% of each type of anchor bolts. The SITA shall be permitted to visually inspect up to 100% of the anchor bolts if the SITA Staff believe appropriate, based on the conditions observed. Visual inspection and testing of anchor bolts shall include verification that the bolts are snug tight in the opinion of the SITA, wedge anchors are fully torqued and no longer able to rotate, and verification that the grade, diameter, location, and minimum length beyond the nut generally conform with the reviewed steel submittals.
3) Overhead Adhesive Anchors: The SITA Staff shall be present during the installation of all adhesive anchors oriented vertically such that the anchors are in tension, if there are any such anchors on the project. During the installation, the SITA shall visually inspect the bolts as with all other anchor bolts and inspect the installation, commenting if the installation does not appear to be consistent with the manufacturer's recommended installation procedures.

f. Metal Deck: For all metal deck, verify the type, gauge, finish, weld pattern and sidelap connections conform with the reviewed deck submittals.

g. While onsite, the SITA shall be empowered but shall not be obligated to make comments and/or ask questions during inspections regarding related conditions, including but not limited to unsafe conditions, counterfeit steel members and/or bolts, galvanized steel being cut/scratched/welded (which is not permitted), exterior exposure of non-galvanized material that is not to be painted, welding procedures, steel angle supports around openings in metal deck, deck closures, fire protection, removal of backer plates, grinding of exposed welds, temporary or permanent bracing, and visual acuity of welders.

J. Structural Observations for Steel Construction

1. After construction of all structural steel that is indicated on the Structural drawings to be a part of or to be within the shelter envelope (as defined by sheet G4.1), a Structural Observer shall verify that all steel members (steel columns, steel beams, steel joists, steel decking, etc.) generally conform with the contract documents. In addition, a Structural Observer shall verify that all connections of members to be a part of or to be within the shelter envelope generally conformed with the sealed shop drawings provided by the Contractor's engineer and approved by the Architect.
2. After construction of all cold-formed metal framing (CFMF) for premanufactured covered walkways, a Structural Observer shall verify that all framing and connections generally conform with the sealed shop drawings provided by the Contractor's engineer and approved by the Architect.

K. Special Inspection of Storm Doors
1. For a minimum of two Storm Doors of each type of Storm Door and at least 20% each type of Storm Door (whichever is greater), a Storm Door Inspector shall be present during the installation of all jamb and header anchors through the frames into the structural wall system of the Tornado Shelter. Single-leaf Storm Doors, double-leaf Storm Doors and Storm Shutters shall all be considered different types of Storm Doors. The Inspector shall verify that the gap between the frame and the structural wall system is within the manufacturer's acceptable construction tolerances and that the anchor type, location and depth of embedment and installation procedure meet the storm door anchor engineer's requirements.
2. For all Storm Doors on the project, a Storm Door Inspector shall visit the site after the doors have been installed and verify that the doors are operational, that shims are installed between the doors and hardware, that the door is labelled, that the frame is labelled and that the exit device is labelled. The Inspector shall also verify that the gap between the bottom of the door and the top of the bottom strike is within the manufacturer's acceptable tolerances. The Inspector shall also verify that the door, frame and exit device are 90 minute fire labeled for both double leaf Storm Doors. The Inspector shall also verify that the bottom and top bolts fully engage the bottom and top strikes.

L. Special Inspection of Storm Louvers
1. For a minimum of two Storm Louvers and at least 20% of the Storm Louvers (whichever is greater), a Storm Louver Inspector shall be present during the installation of all anchors into the structural wall system of the Tornado Shelter. Furthermore, it shall be required that Storm Louvers which are inspected include all of the interior-most upper Storm Louvers (which are the most critical type of all the Storm Louvers). (The interior-most lower Storm Louvers are the second-most critical type of the Storm Louvers.) The Inspector shall verify that the gap between the frame and the structural wall system is within the manufacturer's acceptable construction tolerances and that the anchor type, location and depth of embedment and installation procedure meet the storm louver anchor engineer's requirements.all interior-most upper Storm Louvers,making sure that all interior-most upper Storm Louvers are in the Tornado Shelter.

M. Code-Required Structural Observation of the completed Tornado Shelter
1. The Structural Engineer of Record, or another Professional Engineer licensed in the State of Texas acting as a Structural Observer on behalf of the Structural Engineer of Record, shall make structural observations after the Contractor believes the construction of the Tornado Shelter is complete (including but not limited to installation of Storm Doors and Storm Louvers). This should occur during the "Tornado Shelter Walk-Through" as required by Section 01 1400 before the Contractor requests a Certificate of Substantial Completion.

3.04 QUALITY CONTROL SPECIFIED BY THE CIVIL ENGINEER

A. Reference Civil drawings for quality control required by the Civil Engineer.

3.05 QUALITY CONTROL SPECIFIED BY THE ARCHITECT

A. Special Inspections for Firestopping Penetrations and Joints

1. Before the installation of any firestopping at penetrations and joints, the SITA shall verify that the installer of firestopping at penetrations and joints is an FM4991 “Approved Standard for Firestop Contractors” approved firestop contractor or UL Qualified Firestop Contractor.
2. The SITA shall inspect firestopping at penetrations in accordance with ASTM E 2174 “Standard Practice for On-Site Inspection of Installed Fire Stops” for each type of firestop being used. A unique “type” shall be defined by the UL Fire Resistance Directory utilizing UL’s alpha-alpha-numeric numbering system based on a specific combination of penetrant, substrate and firestop product. For each type of penetration, inspections shall be by either witnessing the entire installation of 10% of the penetrations. Alternatively, for each type of penetration that is not a pre-formed firestopping penetration device, inspections shall be permitted to be by the SITA removing a portion of the firestopping at 2% of the penetrations, verifying the proper depth of installation (and compression at mineral wool, if applicable) and the firestopping installer replacing the firestopping in the presence of the SITA. For preformed-devices, the inspection shall be either by witnessing 10% of the installation of each type of firestop, or alternatively by a post-installation verification that the installed system complies with the reference listed system or engineering judgment. If non-compliant conditions are encountered by the SITA, the SITA shall proceed as directed by ASTM E 2174.
3. The SITA shall inspect firestopping at joints in accordance with ASTM E 2393 “Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers” for each type of firestop being used. A unique “type” shall be defined by the UL Fire Resistance Directory utilizing UL’s alpha-alpha-numeric numbering system based on a specific combination of joint type (head of wall, wall to wall, floor to wall, floor to floor, floor to exterior wall) firestopping material or system (for example, intumescent, caulk, mortar, sealant, mechanical, factory preassembled), and substrates (for example, gypsum wall, concrete floor, composite floor deck). For each type of joint, inspections shall be by either witnessing 5% of the total lineal feet to be installed on the project. Alternatively, inspections shall be permitted to be by the SITA removing at least 1 foot every 500 linear feet of the firestopping on the project, verifying the proper depth (and compression at mineral wool, if applicable) of installation and the firestopping installer replacing the firestopping in the presence of the SITA, or in the case of a pre-formed firestopping joint device, by verifying that the device has been installed in accordance with the reference listed system or engineering judgment. If non-compliant conditions are encountered by the SITA, the SITA shall proceed as directed by ASTM E 2393.
4. If at any time, material removed by the SITA from penetrations and/or joints for a type does not conform to the project requirements, the SITA shall double the amount of destructive testing for that type unless the penetrations and joints were installed by SITA witnessing installation. Further non-compliance shall be addressed as directed by ASTM E 2174 and/or ASTM E 2393. If at any time, installation of firestopping at penetrations and/or joints does not conform with the contract documents while being witnessed by the SITA inspector, the SITA inspector is to proceed as directed by ASTM E 2174 and/or ASTM E 2393. Non-compliance according to these ASTM’s may lead to work stoppage that requires approval by the AHJ to resolve the non-compliance.

3.06 QUALITY CONTROL SPECIFIED BY THE MECHANICAL AND ELECTRICAL ENGINEERS

A. The CxA shall visit the site to make observations as specified by Section 01 9100, Section 01 4533 and Divisions 22-26.

3.07 FINAL QUALITY ASSURANCE REPORTS

A. General

1. Before applying for a Certificate of Occupancy, the Contractor shall obtain a Final Report from each of the following quality control firms and submit them all at one time to the AHJ:
   a. SITA, Final Report of Special Inspections and Testing
   b. CxA, Final Report of Commissioning
   c. Code-Required Structural Observer(s), Final Report of Code-Required Structural Observation. (If all code-required structural observations were performed by the Structural Engineer, it shall be permitted for the Structural Engineer to write only one letter instead of two.)
   d. Structural Engineer, Final Report of Structural Engineering Observations
   e. Mechanical Engineer, Final Report of Mechanical Engineering Observations
   f. Electrical Engineer, Final Report of Electrical Engineering Observations
2. Quality assurance personnel shall not be required by the AHJ to issue any certifications, guarantees, or warranties because that is not in their scope of work. Specific language or formatting of the final report shall not be considered a requirement by the AHJ for this project unless the AHJ indicates otherwise before a building permit is issued. (If specific language is desired, quality assurance personnel would need to understand that specific language before performing their scope of work to ensure that they can accurately write a letter with that language.)
3. The Final Report from every firm providing quality control services shall be sealed by a Professional Engineer licensed in the State of Texas and shall indicate, if it is true, that the author of the Final Report:
   a. Represents the firm, identifying which quality control services were provided by that firm,
      1) Has reviewed all previous reports and believes all of the quality control services required by Section 01 4533 to be performed by their firm have been performed,
      2) Has reviewed all previous reports and believes there are no unresolved deficiencies, and,
      3) To the best of his or her knowledge, regarding the portion of the project associated with their scope of work, they believe the construction conforms.
         (a) The SITA shall indicate they believe the results of inspections and testing were within project specifications.
         (b) Quality control observers shall indicate they believe the construction generally conforms with the contract documents.
4. An example of acceptable language in a Final Report is as follows:
   a. For the SITA: “I am the Construction Materials Engineer representing [insert SITA firm’s name], which was responsible for providing Special Inspections and Testing Agency (SITA) services for the [insert project name] located at [insert project address], Huckabee project number [insert project number]. I have reviewed all previous reports from our firm and believe all of the quality control services required by Section 01 4533 of the Project Manual to be performed by the SITA have been performed. I have also reviewed all previous reports from our firm and believe there are no unresolved deficiencies. To the best of my knowledge, regarding the portion of the project associated with our firm’s scope of work, I believe the results of inspections and testing were within project specifications.”
   b. For the CxA: “I am the individual representing [insert CxA firm’s name], which was responsible for providing Commissioning (CxA) services for the [insert project name] located at [insert project address], Huckabee project number [insert project number]. I have reviewed all previous reports from our firm and believe all of the quality control services required by Section 01 4533 of the Project Manual to be performed by the CxA have been performed. I have also reviewed all previous reports from our firm and believe there are no unresolved deficiencies. To the best of my knowledge, regarding the portion of the project associated with our firm’s scope of work, I believe the construction generally conforms with the contract documents.”

c. For the Code-Required Structural Observer: “We were the Structural Observers representing [insert Structural Observation firm’s name], which was responsible for providing Code-Required Structural Observations services for the [insert project name] located at [insert project address], Huckabee project number [insert project number]. We have reviewed all previous reports from our firm and believe all of the quality control services required by Section 01 4533 of the Project Manual to be performed by the Code-Required Structural Observer have been performed. The Contractor is obligated to address all of my observations and has indicated to me that this was done. Therefore, to the best of my knowledge, I believe the structural system for the Tornado Shelter generally conforms with the contract documents.”

d. For the Structural Engineer, Mechanical Engineer and Electrical Engineer: “I am the [insert project role] representing [insert firm’s name], which was responsible for providing observations for the [insert project name] located at [insert project address], Huckabee project number [insert project number]. I and/or a representative of my firm visited the site at certain stages of construction and made observations. The Contractor is obligated to address all of my observations and has indicated to me that this was done. Therefore, to the best of my knowledge, I believe the construction related to my role generally conforms with the contract documents.”

B. Request for Final Report

1. Within 48 hours of receiving the last inspection, test or observation report expected for the project (regarding any portion of the project) from each firm providing quality control services, the Contractor shall issue an RFI requesting a Final Report of Quality Control from that firm. For clarification, the Contractor shall not be permitted to wait until the end of the project or even until all quality control firms have completed their work. The Contractor shall be responsible for addressing any unresolved deficiencies and submit a written statement to all quality assurance observers in the RFI that their observations were fully addressed before requesting this report from each firm. For proposal purposes, the Contractor shall assume that within ten (10) business days each firm providing quality control services will either issue this report without any unresolved deficiencies or identify in writing any known but unresolved deficiencies. If any unresolved deficiencies are identified during this process, the Contractor shall address these deficiencies and then request a final report again.

2. When the Contractor requests a Final Report of Quality Control from each quality control firm, quality control personnel shall verify that the scope of quality control services required by Specification Section 01 4533 was performed and that any deficiencies identified have been addressed.

a. If it appears there are no unresolved deficiencies, the firm shall create and distribute a Final Report within ten (10) business days of receiving the request from the Contractor for the final report. The final report shall be sealed by a professional engineer licensed in the state of Texas and shall be distributed to the Contractor and the Architect.

b. If the firm determines that there are unresolved deficiencies, the firm shall notify the Contractor within ten (10) business days of receiving the request from the Contractor for the Final Report that a Final Report cannot be provided until all unresolved deficiencies are resolved. It is preferred but not required that the firm also provide the Contractor a complete list of all deficiencies identified by the firm to date.

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. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Project identification sign.

H. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances

1.03 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes including review and inspection of work.

B. New permanent facilities may not be used.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Use of existing facilities is not permitted.

C. New permanent facilities may not be used during construction operations.

D. Maintain daily in clean and sanitary condition.

E. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas., to allow for owner's use of siteProtect existing facilities and adjacent properties from damage from construction operations and demolition. Implement safety precautions that comply with all regulatory requirements.

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.

1.06 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

C. On sites where students are present, no work shall commence prior to fence being in place.

1.07 EXTERIOR ENCLOSURES

A. Provide temporary 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.

1.08 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.09 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. Designated existing on-site roads may be used for construction traffic.

F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

G. Do not allow vehicle parking on existing pavement.

1.10 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. If materials to be recycled or re-used on the project must be stored on-site, provide suitable and secure non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

C. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

A. No later than ten (10) days after the Notice to Proceed, and prior to start of construction, provide a job sign at the job site.

B. Request sign layout and details from the Architect.

C. Reference Section 01 2100 - Allowances for cash allowance for project sign.

D. Contractor shall be responsible to pick up sign.

E. Provide project identification sign of design and construction indicated on drawings.

F. Erect on site at location indicated.

G. No other signs are allowed without Architect's permission except those required by law.

1.12 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack .

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Provide separate work station similarly equipped and furnished, for use of Architect..

D. Locate offices a minimum distance of 50 feet from existing and new structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to final punch list and review inspection.

B. Remove underground installations to a minimum depth of 3 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 5719
INDOOR AIR QUALITY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Testing indoor air quality before commencement of construction; existing building areas only.

C. Testing indoor air quality after completion of construction.

1.02 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Cleaning of ductwork is not contemplated under this Contract.
   2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
   3. Establish condition of existing ducts and equipment prior to start of alterations.

B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017.

B. ASHRAE Std 129 - Measuring Air-Change Effectiveness.; 1997 (Reaffirmed 2002).

C. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization; 2010.

D. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.04 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.05 SUBMITTALS

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

B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
   1. Submit not less than 60 days before enclosure of building.
   2. Identify potential sources of odor and dust.
   3. Identify construction activities likely to produce odor or dust.
   4. Identify areas of project potentially affected, especially occupied areas.
   5. Evaluate potential problems by severity and describe methods of control.
   6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.

7. Describe cleaning and dust control procedures.
8. Describe coordination with commissioning procedures.

C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.

E. Indoor Air Quality Testing Plan: Identify:
1. Testing agency qualifications.
2. Locations and scheduling of air sampling.
3. Test procedures, in detail.
4. Test instruments and apparatus.
5. Sampling methods.

F. Indoor Air Quality Testing Reports: Show:
1. Location where each sample was taken, and time.
2. Test values for each air sample.
3. HVAC operating conditions.
4. Certification of test equipment calibration.
5. Other conditions or discrepancies that might have influenced results.
6. Interpretation of test results.
7. Recommendations for improvement of indoor air quality or retesting.

1.06 QUALITY ASSURANCE

A. Firm Qualifications: The indoor air quality testing firm must have a minimum of five years experience specifically in the indoor environmental quality field and must have indoor environmental testing and consulting capabilities. Firm should be a licensed mold assessment company (ACO) through the Texas Department of Licensing and Regulation (TDLR), and should have a minimum of one mold assessment consultant (MAC) on staff. Additionally, the firm's consultants should maintain current certification in indoor environmental consulting (i.e. Certified Indoor Environmental Consultant (CIEC) through the American Council for Accredited Certification (ACAC) or other certifying association. The firm should employ a LEED-Accredited Professional, certified by the United States Green Building Council (USGBC).

B. Laboratory Qualifications: The microbiology testing laboratory utilized by the consulting firm should have a minimum of five years experience, be a licensed mold analysis laboratory through the Texas Department of Licensing and Regulation (TDLR), and should employ a degreed mycologist. The industrial hygiene laboratory utilized by the consulting firm should have a minimum of five years experience, and be accredited by the American Industrial Hygiene Association (AIHA).

PART 2 PRODUCTS

2.01 MATERIALS

A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE Std 52.2.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.

D. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area. Provide pre-construction air filters to all return air registers in adjacent occupied areas.

E. Use of HVAC equipment and ductwork for ventilation during construction is not permitted:
   1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
   2. Exhaust directly to outside.
   3. Seal HVAC air inlets and outlets immediately after duct installation.

F. Do not store construction materials or waste in mechanical or electrical rooms.

G. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
   1. Inspect duct intakes, return air grilles, and terminal units for dust.
   2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
   3. Clean tops of doors and frames.
   4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
   5. Clean return plenums of air handling units.
   6. Remove intake filters last, after cleaning is complete.

H. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

I. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.02 INDOOR AIR QUALITY TESTING (IAQ)

A. On-site Observations
   1. A minimum of two (2) visits for renovations and up to six (6) site visits for new construction will be made to the site to conduct on-site observations during the construction phase relative to water intrusion issues or other building conditions that might cause future degradation to indoor air quality. These observations may include but are not limited to landscape grade and drainage, foundation height, exterior wall sealing, roof and wall enclosure penetrations, water or moisture intrusion, plumbing, storage and condition of absorbent building materials, sealing and hygiene of HVAC systems, control of particulates, etc.
   2. This phase may also include a review of specifications for building products such as paint, adhesives, carpet, and cabinetry for products that might degrade future indoor air quality when installed.
   3. A written report will be submitted to the Architect or Owner’s representative after each on-site observation. The report will include project conditions on the day of inspection along with cited potential problems areas and photo-documentation as needed.
      a. Critical Condition Report: If a condition is cited that may cause potential microbial contamination in area that is ready to be sealed or covered, a verbal report will be communicated to the Architect or Owner’s representative within one business day so the Contractor can have the condition corrected before work is continued.
      b. Standard Report: A written report will be submitted to the Architect or Owner’s representative within ten (10) working days of the site visit.

B. Pre-Construction Inspection and Sampling: Perform indoor air quality testing before starting construction, as base line for evaluation of post-construction testing.

1. If the construction project is an addition to an existing facility, pre-construction inspection and sampling will be conducted to determine baseline conditions within the existing facility.
2. The testing conducted in item C-2 of the pre-occupancy testing below will be conducted in areas of the existing facility that will be adjoining the new construction.
3. During construction activities on-site observations will include any impact to the indoor air quality of the existing facility.

C. Pre-Occupancy Inspection and Sampling: Perform indoor air quality testing before occupancy.
1. After substantial completion of the facility and before non-fixed furnishings are delivered, the firm will conduct an IAQ inspection and perform representative sampling for indoor air quality parameters. These measurements will establish background pre-occupancy conditions, and will be evaluated for acceptable levels. All samples collected will be area screening samples to determine the presence of the parameters of interest. If the screening results indicate significant positive results, additional investigation may be required.
2. The air quality sampling includes the collection of samples for the determination of populations and concentrations of total fungal bioaerosols in the ambient air. The sampling also includes the collection of chemical samples for fixed gas analysis for total volatile organic compounds (TVOCs), methane, carbon dioxide, and carbon monoxide. Additional real-time monitoring will be conducted for the following parameters: temperature, relative humidity, carbon dioxide, carbon monoxide, TVOCs, ozone, and large (2.5 to 10 microns) and small particulates (<2.5 microns).
3. Testing in a school facility will include the collection of samples in representative areas of the classroom wings (to include a minimum of 20% of the classrooms), and if part of the new construction, in the cafeteria, library, administration offices, gymnasium, and locker rooms. Additionally, two outdoor samples will be collected on each day of testing for comparison purposes.
4. If significant areas of rubber-backed carpeting and/or composite fixed furnishings are present in the facility, testing will also be conducted in representative areas for 4-phenylcyclohexene and formaldehyde in the ambient air. This testing will not be conducted if carpeting and fixed furnishings have been installed which are certified to be free of these chemicals.
5. Testing for radon should be conducted only for subterranean structures or in geographical areas where radon has been previously documented on a reoccurring basis.
6. Testing for lead-based paint and asbestos-containing materials will not be conducted unless there is an indication that lead-based paint and/or asbestos-containing materials may be present in the existing structure, and that it may be impacted by the new construction activities. Historical asbestos testing records, asbestos management plans, or lead-based paint surveys may be provided in lieu of testing.
7. A report of findings and any recommendations will be provided within fifteen (15) working days of the sampling event.

D. Do not start pre-occupancy indoor air quality testing until:
1. All construction is complete, including interior finishes.
2. HVAC systems have been tested, adjusted, and balanced for proper operation.
3. Cleaning of inside of HVAC ductwork, if specified elsewhere, has been completed.
4. New HVAC filtration media have been installed.

E. Post-Occupancy Inspection and Sampling:
1. At five (5) months and eleven (11) months following substantial completion, but prior to the one (1) year project inspection, the testing conducted in item C-2 of the pre-occupancy testing above will be repeated.
2. A report of findings and any recommendations will be provided within fifteen (15) working days of the sampling event.

F. Indoor Air Quality Acceptance Criteria
   1. Upon completion of the project, the indoor air quality testing firm will provide a report of findings to the Architect or Owner's representative indicating any IAQ parameters that do not meet the acceptance criteria.
   2. The following criteria will be used to determine acceptance:
      a. Fungal Bioaerosols - measure in relation to outdoor air, generally not higher than outdoor air, and containing indoor populations and concentrations of fungi that are considered normal and typical. Use professional judgment of testing firm.
      b. Carbon Monoxide - measure in ppm, in relation to outdoor air. Not more than 2 ppm over outdoor air levels, and less than 9 ppm.
      c. Carbon Dioxide - measure in ppm, in relation to outdoor air. Not more than 700 ppm higher than outdoor air.
      d. Methane - measure in ppm. Not more than 5 ppm.
      e. Total Volatile Organic Compounds (TVOCs) - measure in ppm as methane, or micrograms per cubic meter (µg/m3) - not more than outdoor air, and less than 5 ppm (calculated as methane) or 3,000 µg/m3.
      f. Total Particulates - measure in total particle counts per cubic foot - total particle counts generally less than one-half (1/2) of outdoor air. Particle counts broken down to small (<2.5 microns) and large (2.5 to 10 microns).
      g. Radon - less than 2 picoCuries per liter (pCi/L).
      h. Ozone - nor more than outdoor air, and less than 0.1 ppm.
      i. Formaldehyde - measure in parts per million (ppm) - less than 0.050 ppm.
      j. 4-Phenylcyclohexene(if rubber-backed products) - measure in micrograms per cubic meter (µg/m3) - not more than 6.5 µg/m3.
      k. Lead - have paint supplier or contractor provide documentation of lead-free paint.

G. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to Owner.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Substitution limitations.

D. Procedures for Owner-supplied products.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is not prohibited.
   1. If reuse of other existing materials or equipment is desired, submit substitution request.
   2. All items called for on the drawings to be salvaged, removed and relocated shall be inventoried, removed and stored until such time as they are to be installed in their new location. The inventory list shall be given to the Owner and shall include an itemized list that includes quantities, descriptions and condition of each item. These items are considered to be in good operating condition at the time the contract is signed, and shall remain the property of Owner. These items shall be properly protected by the contractor and removed by him, complete, including all appurtenances and reinstalled in their new location in good working order with any modifications called for by the drawings.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Where other criteria are met, Contractor shall give preference to products that:
   1. Are extracted, harvested, and/or manufactured closer to the location of the project.
   2. Have longer documented life span under normal use.
   3. Are made of recycled materials.
   4. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.

C. Provide interchangeable components of the same manufacture for components being replaced unless noted otherwise in the contract documents.

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 to Project site and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. All substitutions shall be submitted on the Architects form as described in paragraph 3.03.

B. Product Substitution - Prior to Bid
   1. No products shall be used on the project unless they are specified or have received prior approval.
   2. Products to be reviewed prior to bid shall be submitted and reviewed under the provisions of this section.
   3. Substitution request including all required documentation must be delivered to the Architect’s office no later than ten (10) calendar days prior to the proposal date designated in the project manual. Requests submitted late will not be considered.
   4. No product will be considered “as equal” to the product specified until it has been included as an allowable substitution, in a written Addendum to the project.

C. Product Substitution - Post Contract Award
   1. Product substitutions are not allowed except for the following provisions:
      a. Product is required for compliance with interpretation with code compliance.
      b. Product specified is unavailable.
      c. Product proposed will provide a credit to the Owner.
         1) Contractor shall provide amount of proposed savings on the substitution request form.
      d. Product proposed will provide a substantial benefit to the Owner’s schedule.
         1) Contractor shall clearly delineate the positive impact to the project schedule.
      e. Product supplier contractor default.
         1) Written documentation will be required to substantiate request.
   2. Substitution request including all required documentation must be delivered to the Architect’s office no later than fifteen (15) calendar days after execution of the Contract.
   3. Reimbursement of Architect's costs
      a. In the event substitutions are proposed to the Architect after the Contract has been awarded, the Architect will record all time used by him and by his consultants in evaluation of each such proposed substitution.
      b. Whether or not the Architect approves a proposed substitution, the Contractor promptly upon receipt of the Architect's billing shall reimburse the Architect at the rate of two and one-half times the direct cost to the Architect and his consultants for all time spent by them in evaluating the proposed substitution.

3.02 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Proposed product substitution shall comply with all applicable codes. Products not conforming to codes shall be removed and replaced at Contractors expense.

B. Coordination of substitutions:
   1. Prior to each product substitution, carefully review and coordinate all aspects of each item being submitted.
   2. Verify that each item and the submittal for it conform in all respects with the specified requirements.
   3. By submitting the substitution request form with each submittal, the contractor certifies that this coordination has been performed.

C. Substitutions:
   1. The Contract is based on the standards of quality established in the Contract Documents.
   2. Products specified by reference to standard specifications such as ASTM and similar standards do not require further approval.
   3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved in writing for this Work by the Architect.

D. Coordination of Materials and Installation
   1. General contractor shall install all fire protection, electrical and data wiring in conduit as high as possible and above mechanical ductwork. General contractor shall install all fire protection, electrical, data, and wiring in conduit in areas designated on the plans while coordinating structure, mechanical equipment/ductwork, lighting, building controls, and architectural systems. The proposed layout of these systems and conduit shall be reviewed with and accepted by the architect prior to installation. Systems and conduit shall group in the area designated by the construction documents in an orderly and clean installation. Final locations and conditions of these systems and conduit shall only be accepted by the architect upon review after installation.

E. Miscellaneous Materials
   1. If proposed product substitution requires additional materials or accessories for installation in the project, Contractor shall be responsible for all costs.

F. Finishes
   1. Proposed product substitution shall not decrease the selection of colors or finishes.

G. Storage and Handling
   1. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

H. Warranty
   1. Warranty of product shall not be less than that of specified product.

3.03 PRODUCT SUBSTITUTION REQUEST FORM

A. The Architect’s “Substitution Request Form” must be used for each product submitted for consideration. The form is attached following this Section.

B. The Individual or Firm requesting a substitution must document that the requested substitution is equal or superior to the specified product. Failure to provide clear, accurate, and adequate documentation will be grounds for rejection. Any re-submittal will be handled as a new request.

C. Required documentation shall consist of applicable information which would aid the Architect in making an informed decision. Include side by side product comparisons, technical data, laboratory test results, product drawings, etc. References shall include three projects, which are from one to two years old, and three projects older than five years. Provide a list of references with the owners contact name and phone number.

D. If use of the proposed product would result in changes to the design of the building, the submittal shall describe fully the changes required to the drawings or project manual. Any cost differences resulting from modifications to the drawings and project manual and the cost of making the changes shall be borne by the Product Supplier.

E. Incomplete forms shall be rejected. The decision of the Architect is final.

3.04 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.

4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

END OF SECTION

MORE THAN ARCHITECTS

INSTRUCTIONS FOR USE OF SUBSTITUTION REQUEST FORM

STEPS

1. Substitution request **including all required documentation** must be emailed to the Project Leader at the Architects office no later than the date indicated in the specifications. Requests submitted late will not be considered. Contact information can be found on the Huckabee website bidding section under the specific project at: www.huckabee-inc.com/construction/

2. The Huckabee "Substitution Request Form" must be used for each project submitted for consideration.

3. The Individual or Firm requesting a substitution must document that the requested substitution is equal or superior to the specified product. Failure to provide clear, accurate, and adequate documentation will be grounds for rejection. Any re-submittal will be handled as a new request.

4. Required documentation shall consist of applicable information which would aid the Architect in making an informed decision. Include **side-by-side product comparisons**, technical data, laboratory test results, product drawings, etc. References shall include three projects which are from one to two years old, and three projects older than five years. Provide a list of references with the owner's contact name and telephone number.

5. If use of the proposed product would result in changes to the design of the building, the submittal shall describe fully the changes required to the drawings or specifications. Any cost differences resulting from modifications to the drawings and specifications and the cost of making the changes shall be borne by the Product Supplier.

6. **No** product will be considered "as equal" to the product specified until it has been included as an allowable substitution in a written Addendum to the project.

7. The decision of the Architect is final.

MORE THAN ARCHITECTS

SUBSTITUTION REQUEST FORM

Architect Project No:_____ Bid Date:_____ Date of Request:_____

Project Name: _____

SUBSTITUTION REQUEST BY:

Firm:_____

Address:_____

_____

Phone: _____

Fax: _____

We hereby request that the following Substitution be allowed in lieu of the Product specified on the above project.

ARCHITECT / ENGINEERS RESPONSE:

☐ APPROVED ☐ APPROVED AS NOTED

☐ NOT APPROVED ☐ SUBMITTED TOO LATE

☐ FAILED TO PROVIDE ADEQUATE INFORMATION

REMARKS:_____

_____

BY:_____DATE:_____

SPECIFIED PRODUCT_____ **SPECIFICATION SECTION** _____

PROPOSED PRODUCT SUBSTITUTION_____

This request includes the following: attached Technical Data, Laboratory Tests and proposed changes to the Drawings and Specifications, which the proposed Substitution will require for proper installation.

_____

_____

The Firm requesting the Substitution agrees to pay for changes to the building design, including Architectural, Engineering, and detailing costs caused by the requested Substitution. ☐ YES ☐ NO ☐ NOT APPLICABLE

What effect does the Substitution have on other trades? _____

_____

What effect does Substitution have on Construction Schedule? _____

_____

Differences between proposed Substitution and specified item? _____

_____

Manufacturer's guarantees of the proposed and specified items are: _____ Same _____ Different
(If different, explain on attachment)

The undersigned state that the function, appearance and quality are equivalent or superior to the specified item.

_____
SIGNATURE

_____ _____
TITLE DATE

Huckabee

SECTION 01 6210
SCHEDULE OF MATERIALS AND COLORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Information and procedures for color submission for color schedule.

B. Schedule of Materials and Colors for pre-selected colors.

1.02 COLOR SCHEDULE PROCEDURES - PRE-BID SELECTED

A. Contractor shall hold color samples requiring color selections until all are received. Only then shall the actual color samples be submitted to the Architect for selection. Colors samples matching color schedule shall not be submitted until field sample verifications are required.
   1. Contractor shall submit a complete transmittal letter with each related group of items. Each sample shall be properly labeled with the name of the project, contractor, manufacturer, and date of submission. Incomplete color submittals will be returned to the Contractor.
   2. The Contractor shall allow two (2) weeks after all colors are submitted for final Owner approval.

1.03 COLOR SCHEDULE PROCEDURES - POST-BID SELECTED

A. Contractor shall hold all color samples until all items requiring color selections are received. Only then shall the actual color samples be submitted to the Architect for selection.
   1. Colors are noted on the drawings, and as specified. Where colors are not specified, Architect will select color with final color schedule.
   2. Contractor shall submit a complete transmittal letter with each related group of items. Each sample shall be properly labeled with the name of the project, contractor, manufacturer, and date of submission. Incomplete color submittals will be returned to the Contractor.
   3. The Contractor shall allow five (5) weeks after all colors are submitted for final Owner approval.

1.04 COLORS AND PATTERNS

A. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate color and pattern charts to the Architect for selection.

B. Verify all graphics with the Architect before proceeding. Graphics may need to be adjusted to reflect the same composition as that shown on the drawings.

1.05 SUBMITTALS

A. Field Samples
   1. Once colors are selected, and received at the job site and prior to application or installation, the Contractor shall submit one (1) sample of each item to the Architect for verification of color and pattern.
   2. The Contractor shall allow five (5) working days from date of receipt of submission for verification notification.

1.06 SCHEDULING

A. Contractor shall submit all products in a timely manner to avoid project delays for long lead time items.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers listed or named in a product or system specification are those manufacturers considered capable of manufacturing products conforming to the specification requirements.

B. The “listing” or “naming” of a manufacturer does not imply “acceptance” or “approval” of any standard product of that manufacturer.

C. Products listed or named manufacturers proposed for use shall be comparable in all respects to specified make or model number designation of named products and shall meet or exceed specification requirements of type, function, color, and quality.

D. Where products are specified by naming model number and manufacturers only, the named products establish a standard of quality. Refer to individual specification sections for additional manufacturers and procedures.

2.02 MATERIALS - GENERAL

A. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
   2. Provide trim and accessories that match color and finish unless noted otherwise.
   3. Where contractor is submitting a substitution, contractor shall provide color equal to that specified. Substituted colors are not considered approved unless published in writing in Addendum prior to bid. If substituted product does not match specified color, contractor shall provide custom color as required at no additional cost to the owner.

PART 3 - EXECUTION

3.01 APPLICATION

A. Paint any vents, grilles, piping, columns, etc. the same color as the wall or graphic unless noted otherwise.

B. Unless otherwise noted, all accent paint shall terminate at an inside corner. If wall terminates at storefront, wrap paint to meet edge of storefront.

C. All exposed concrete shall be sealed.

3.02 SCHEDULE OF MATERIALS AND COLORS

A. General Notes:
   1. All paint colors are subject to last shade adjustments.
   2. The Contractor shall submit samples of all finishes for comparison and approval of colors to the items listed in the color schedule.
   3. Where multiple buildings occur in one project, all materials and finishes may not apply to all buildings. Refer to the drawings for material and finish locations.
   4. The General Contractor shall verify all colors selections and numbers and note any drawings changes that may have occurred. Notify the Architect of any discrepancies found within 14 days.
   5. Notes stating "See Drawings for Locations" refer to the Construction Documents.
   6. Where note “pending submittal” occurs, Contractor shall submit samples of the material that meets the Standards outlined in the appropriate specification for Architect’s review and selection. For materials with more than one color, texture or pattern available, Contractor shall submit the Manufacturer’s full range of colors, texture and patterns.
   7. If there is a conflict between the product, material or color specified in this Legend and the product's specification Section within the Division, notify the Architect immediately. The Schedule of Materials and Colors shall govern unless a written clarification is given.

B. See Drawings for Schedule of Materials and Colors for specific product details and requirements.

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, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

K. Administration of Warranty Phase.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

F. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural and load bearing members.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

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

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.

3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.
6. Include in request:
    a. Identification of Project.
    b. Location and description of affected work.
    c. Necessity for cutting or alteration.
    d. Description of proposed work and products to be used.
    e. Effect on work of Owner
    f. Date and time work will be executed.

1.05 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.
    1. Minimum of 5 years of documented experience.

B. For surveying work, employ a land surveyor registered in Texas and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Texas. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in Texas.

1.06 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.

2. Indoors: Limit conduct of especially noisy interior work to 8 am to 5 pm.

H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
   1. Pest Control Service: Monthly treatments.

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.

1.07 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

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

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.

G. Prior to start of work, photo and/or video document all portions of the building.

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, Contractor will 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. Contractor, subcontractor, and manufacturer's representative shall be present.

C. Notify Architect seven (7) days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review approved submittals.
   2. Review conditions of examination, preparation and installation procedures.
   3. Review coordination with related work.
   4. Installation schedule.

E. Record minutes and distribute copies within two days after meeting to participants, with one copies to Architect, Owner, participants, and those affected by decisions made.

F. Pre-installation meeting shall not be scheduled until approved submittals are verified by the Contractor.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that indicated on drawings.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

J. Periodically verify layouts by same means.

K. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Contractor shall ensure all bid and proposal documents and contracts include, if applicable to their trade, all required information related to trench excavation and working safety in compliance with Texas Health and Safety Code 756.021.

C. 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.

D. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

F. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

G. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 NOTIFICATION OF ARCHITECT

A. The Contractor shall notify the Architect a minimum of 48 hours prior to the covering up of any work in progress, in order for the architect to make proper field observations of the work in place. The Contractor shall place NO concrete, fill-in ditches, or cover up walls or ceilings without first contacting the Architect, as noted above and receiving approval.

3.07 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.
   2. Provide sound retardant partitions of construction indicated on drawings 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, Telecommunication, and Technology): 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 acoustical lay-in ceilings and gypsum board/hard 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.

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.

3.08 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 skilled and experienced 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 at interior and weathertight at exterior 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 in accordance with Section 07 8400, 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.

3.09 PROGRESS CLEANING

A. General:
   1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
   2. Do not allow accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
   3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
   4. Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site:
   1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.

2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Restack, tidy, or otherwise service arrangements to meet the requirements of subparagraph A.1 above.
3. Maintain the site in a neat and orderly condition at all times.

C. Structures:
1. Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, sweep interior spaces clean.
   a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and a hand-held broom.
3. As required preparatory to installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the necessary cleanliness.
4. Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials are installed. Damaged floors will be removed and replaced.
   a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material which, in the opinion of the Architect, may be injurious to the finish floor material.

3.10 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. 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.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.11 SYSTEM STARTUP

A. Coordinate with General Commissioning Requirements per Mechanical Specifications.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify Architectand Owner 14 days prior to start-up of each item.

D. 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.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.12 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

B. Refer to individual specification sections for more specific demonstration and training requirements.

3.13 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Division 23 for specific requirements.

3.14 FINAL CLEANING

A. "Clean", for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.

B. The Contractor shall have initial cleaning complete prior to the Architect performing the “Punch List” walkthrough. The building shall be thoroughly (ready for occupancy) cleaned prior to the Owner acceptance (Substantial Completion) of the building.

C. Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in the Article above.

D. Communication Spaces (MDF, IDF Rooms):
   1. Preparing Communication Spaces (MDF, IDF) Rooms For Owner Acceptance.
      a. Contractor shall ensure that all communication spaces supporting owner network electronics are properly prepared for equipment installation.
      b. All steps must be completed seven days prior to the date of equipment installation.
         1) All room electrical systems, receptacles, power and room cooling shall be completed and verified by the Owner or Owner’s representative.
         2) All room lighting shall be completed.
         3) All entry doors shall be installed and locked with keys delivered to the Owner. Access control doors may not be in operation at this time and the room must be secured. Makeshift doors must have prior approval from the Owner or Owner’s representative before installation can begin.
         4) All plywood backboards shall be installed and painted.
         5) All copper and fiber cabling shall be tested, labeled and all test reports and record drawings reviewed and approved by the Owner or Owner’s representative.
         6) All copper and fiber patch cordage shall be installed or at a minimum, delivered to the Owner for installation.
         7) All equipment racks, ladder racks and other required pathway supports shall be properly bonded and grounded to the telecommunications grounding busbar located in the room. All grounding backbones shall be installed from the busbar to the approved building ground and the system tested and approved by the Owner or Owner’s representative.
         8) All sleeves and wall penetrations must be properly fire stopped.
         9) If equipped, all room ceilings shall be installed.
   2. Final Cleaning of Communication Spaces (MDF, IDF) Rooms.

a. All MDF and IDF rooms shall be cleaned prior to the installation of Owner network electronics. This is to prevent construction dust and debris from damaging the equipment.
b. Contractor shall coordinate the date of installation with the Owner so that the cleaning of all MDF and IDF spaces shall be performed no greater than two calendar day prior to the deployment of the equipment.
c. Contractors shall remove all large pieces of drywall, ceiling tiles and other construction related waste from the room. All contractor boxes and other containers must be removed unless prior approval has been given by the Owner.
d. Residual plaster dust shall be brushed, broomed and vacuumed from all equipment racks, ladder racks, conduit sleeves and other wall mounted devices and enclosure surfaces.
e. All floors shall be swept then vacuumed. Do not use wet or damp clothes or mops for this purpose.
f. Contractor shall then wipe down all items as explained above with a damp cloth, let dry, then wipe down a second time using a dry cloth to remove any residual streaks or smears that appear.
g. Mop all floors, let dry, then mop with a second application. Do not use any cleaning agents that are not approved for the floor type used in the room.
h. Notify the Owner and Owner's representative for final acceptance. Contractor shall retain staff resources to address items discovered by the Owner or Owner's representative and re-clean the room as needed.

E. Site:
1. Unless otherwise specifically directed by the Architect, broom clean paved areas on the site and public paved areas adjacent to the site. Powerwash paved surfaces, as required, to remove any stains caused by construction materials, vehicles, or workers, as approved by the Architect, and at no additional cost to the Owner.
2. Completely remove resultant debris.

F. Structures:
1. Exterior:
a. Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
b. Remove all traces of splashed materials from adjacent surfaces.
c. If necessary to achieve a uniform degree of cleanliness, hose down the exterior of the structure.
d. In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the Owner.
2. Interior:
a. Visually inspect all interior surfaces (floors, walls, ceilings, fixtures, furniture, appliances, and equipment) and remove all traces of soil, waste materials, smudges, and other foreign matter.
b. Remove all traces of splashed material from adjacent surfaces.
c. Remove paint droppings, spots, stains, and dirt from finished surfaces.
3. Glass: Clean inside and outside.
4. Polished surfaces: To surfaces requiring routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished.

G. Schedule final cleaning as approved by the Architect to enable the Owner to accept a completely clean Work.

3.15 CLEANING DURING OWNER'S OCCUPANCY

A. Should the Owner occupy the Work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning shall be as determined by the Architect in accordance with the General Conditions of the Contract.

3.16 CLOSEOUT PROCEDURES

A. Project Closeout
   1. No later than 60 days prior to Project Completion, as scheduled on the Contractors Critical Path Schedule, the Contractor shall:
      a. Develop a Project Completion List for any and all tasks that remain along with a schedule for the completion of each. This list and schedule shall be written and delivered to the Owner and Architect.
      b. Provide “hands-on” training to the Owner of all major systems as identified in Section 01 7800 – Closeout Submittals

B. Substantial Completion
   1. Prior to requesting inspection by the Architect, use adequate means to assure that the Work is completed in accordance with the specified requirements and is ready for the requested inspection.
   2. No later than 30 days prior to the scheduled Substantial Completion date the Contractor shall call for a project walk through to determine if the project is substantially complete.
      a. The Contractor shall prepare and submit a list of deficiency items as required by Paragraph 9.8.2 of the General Conditions. This list shall be submitted to the Architect a minimum of 7 days prior to the scheduled walk through.
      b. The Contractor shall provide copies of the complete TAB (Commissioning) report and verification that all repairs have been made and that the systems are operational. This report and verification shall be submitted to the Architect a minimum of 7 days prior to the scheduled walk through.
      c. The Contractor shall obtain the Certificate of Occupancy from the AHJ and supply a copy to the Architect a minimum of 7 days prior to the scheduled walk through and before substantial completion will be issued.
      d. On the scheduled date of the walk through and after receipt of the deficiency list (punch list) the Architect will inspect the project to determine the status of completion.
      e. Following inspection of the work, the Architect determines that the work is not substantially complete:
         1) The Architect promptly will so notify the Contractor, in writing, giving the reasons therefore.
         2) The Contractor shall remedy the deficiencies and notify the Architect when ready for re-inspection. The Architect will make only one trip to re-inspect the project.
         3) The Architect shall be entitled to reimbursement of costs on an hourly basis for time spent to re-inspect the project. Rate for reimbursement shall be two hundred dollars per hour ($200.00/hr) including travel time and shall be charged against the Contractors retainage held for this work.
   3. When the Architect concurs that the Work is substantially complete:
      a. The Architect will prepare a "Certificate of Substantial Completion" on AIA Form G704, accompanied by the Contractor's list of items to be completed or corrected, as verified by the Architect.
      b. The Architect will submit the Certificate to the Owner and to the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

C. Final Completion
   1. Prepare and submit the notice required by the first sentence of Paragraph 9.10.1 of the General Conditions.

2. Verify that the Work is complete including, but not necessarily limited to, the items mentioned in Paragraph 9.8.2 of the General Conditions.
3. Certify that:
    a. Contract Documents have been reviewed;
    b. Work has been inspected for compliance with the Contract Documents;
    c. Work has been completed in accordance with the Contract Documents;
    d. Equipment and systems have been tested as required, and are operational;
    e. Work is completed and ready for final inspection.
4. The Architect will make an inspection to verify status of completion.
5. Should the Architect determine that the Work is incomplete or defective:
    a. The Architect promptly will so notify the Contractor, in writing, listing the incomplete or defective work.
    b. Remedy the deficiencies promptly, and notify the Architect when ready for re-inspection.
6. When the Architect determines that the Work is acceptable under the Contract Documents, he will request the Contractor to make closeout submittals.

D. Closeout Submittals
1. Closeout submittals as described in Section 01 7800 and Architect approval secured.
2. Refer attached Check List.
3. Contractor shall deliver all attic stock referenced in specifications. Attic stock shall be delivered to owners designated location. Contractor shall obtain a signed receipt of delivery.
4. Contractor shall obtain Certificate of Occupancy from the AHJ and submit a copy to the Architect.

E. Release of Funds
1. Retainage for the project will be held until project closeout is complete as verified by the items in paragraph above and the attached Check List including the completion of all Punch List items.
2. The Architect will estimate the cost of each item on the Punch List, withholding funds for each which shall be separate from the retainage. These funds will be released to the Contractor as items are completed and verified on the Punch List.
3. THE RETAINAGE WILL NOT BE RELEASED UNTIL CERTIFICATE OF OCCUPANCY FROM THE AHJ HAS BEEN SUBMITTED TO THE ARCHITECT.
4. THE RETAINAGE WILL NOT BE RELEASED UNTIL THE PROJECT CLOSEOUT IS COMPLETE.

F. Final adjustment of accounts
1. Submit a final statement of accounting to the Architect, showing all adjustments to the Contract Sum.
2. If so required, the Architect will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.

FINAL ACCEPTANCE CHECKLIST

DATE:_____

PROJECT NAME:_____

OWNER'S NAME:_____

COMPLETED BY:_____

TO:_____

COPY TO:_____

THE FOLLOWING CHECKLIST IS COMPLETED AND THEREFORE THE PROJECT IS READY FOR FINAL PAYMENT AS OUTLINED IN THE CONTRACT DOCUMENTS.

Received Final Payment Request and Release of Claims.			
Final Change Order Completed and Signed By All.			
Contractor's Affidavit of Payment of Debts and Claims.			
Consent of Surety To Final Payment.			
All Operation & Maintenance Manuals Received.			
Final Record Drawings Received.			
All Guarantees and Warranties Received.			
Punchlist Fully Cleared (Attached Copy).			
Air Quality and Commissioning Completed and All Items Addressed and Corrected.			
Written Acknowledgement of Lead and Asbestos Free.			
All Attic Stock Delivered to Owner.			
Certificate of Occupancy Obtained From AHJ			

EXPLANATION OF ANY OUTSTANDING ISSUES OR DEFICIENCIES:_____

_____

_____

HEREBY SUBMITTED FOR REVIEW:

SIGNED:_____ **DATE:**_____

3.17 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

1. Review warranty request procedures with the Architect and Owner no less than two weeks prior to Date of Substantial Completion.
2. All work performed and completed during the Contractor's one year warranty period shall be noted as complete and signed off on accordingly on a warranty request form as agreed upon by Owner and Architect. The form will be provided to the Contractor for each item requested for maintenance or repair and is required to be returned, once the work is complete, in the same originally sent document format with cause and corrective action described in detail. All work during the Contractor's one year warranty period shall be communicated by the Contractor to both the Owner and Architect.
3. Contractor shall maintain a complete and accurate schedule of the dates of Substantial Completion, dates upon which the one year warranty on each phase or building which is substantially complete will expire, and dates of Final Completion. Contractor agrees to provide notice of the warranty expiration date to Owner and Architect at least one month prior to the expiration of the one year warranty period on each building or each phase of the building, which has been substantially completed. Prior to termination of the one year warranty period, Contractor shall accompany the Owner and Architect on review of the building and be responsible for correcting any reasonable deficiencies not caused by the Owner or by the use of the building which are observed or reported during the review. For extended warranties required by various sections, i.e. roofing, compressors, mechanical equipment, Owner will notify the Contractor of deficiencies and Contractor shall start remedying these defects within three (3) days of initial notification from Owner. Contractor shall prosecute the work without interruption until accepted by the Owner and the Architect, even though such prosecution should extend beyond the limit of the warranty period.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for digital project records.

B. Project Record Documents.

C. Operation and Maintenance Data.

D. Closeout Documents.

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. Section 01 7900 - Demonstration and Training: Training requirements.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

F. Individual Product Sections: Specific requirements for demonstration and training.

1.03 SUBMITTALS

A. Submittal Procedure

1. Within sixty (60) days following the Notice to Proceed, the Contractor shall submit a list of Expected Closeout Documents for review by the Architect. This list shall include project record documents, operation and maintenance data, warranties, bonds, contract forms, health/safe environment data, attic stock sign offs, Owner training, certifications and inspections, and other types as indicated. All items on the list shall be titled with spec section number and general description - Example: "09 3000 Tiling - 1 year warranty".
2. The Architect will review the list of Expected Closeout Documents, provide revision comments and return it to the Contractor within fourteen (14) business days. If revisions are required, the Contractor shall then resubmit a revised list to the Architect and Owner within fourteen (14) business days and thereafter until approved.
3. Contractor may submit Closeout Documents by Specification Division in full as scopes of work are completed.
4. Within sixty (60) calendar days of substantial completion, Contractor shall submit closeout submittals as required in accordance with this section and secure Architect’s approval.
5. Contractor shall provide cover page with space for Contractor and Architect review stamps for each submission.
6. The Architect's approval of the current status of Project Record Documents may be a prerequisite to the Architect's approval of requests for progress payment and request for final payment under the Contract.
7. Prior to submitting each request for progress payment, secure the Architect's approval of the current status of the Project Record Documents.
8. Prior to submitting request for final payment, Contractor shall submit the final Project Record Documents to the Architect and secure approval.
9. Contractor shall submit a complete set of closeout documents for each project where multiple projects are combined under a single proposal package.
10. Review and Final Submission of Closeout Submittals
    a. Participate in review meetings as required.
    b. Documents shall be reviewed and verified by contractor prior to submission to the Architect.

c. Review submittal with Owner and Architect prior to final submittal for review and electronic archiving.
d. Number shall be Architects project number followed by the appropriate specification section - consecutive submittal number for section.
(Example - 1234-01-01 Tiling 09 3000 - 5)
When material is re-submitted for any reason, transmit under a new letter of transmittal and with a new transmittal number. On re-submittals, cite the original submittal number for reference.
e. Contractor shall allow 14 days from date of submission for Preliminary Architectural Review excluding delivery time to and from the Contractor.
f. The contractor shall be responsible for delays caused by rejection of inadequate or incorrect submittals.
g. Submittals received by Architect without General Contractor's stamp will be rejected.
h. Make changes required from the Preliminary Architectural Review and deliver the Final Project Record Documents to and secure approval from the Architect. When revised for resubmission, identify all changes made since previous submission.
i. Contractor will pay all associated cost in preparing close-out documents.

11. Closeout Submittals Requirements.
    a. Closeout and Record Documents as required by this section shall be provided to the Owner upon completion of the project. Submit the number as outlined below:
        1) Project Record Documents - Drawings and Project Manual
            (a) One (1) copy on USB Flash Drive
        2) Closeout Documents – Including Operation and Maintenance Manuals
            (a) One (1) copy on USB Flash Drive
    b. Electronic Submittal Format.
        1) The digital file shall be set up using a non-proprietary “PDF” format.
        2) All data shall be indexed/book marked and hyperlinked to associated data.
        3) Data shall be searchable by key word. All data shall allow printing of material.
        4) Electronic submittal shall follow the format shown in Part 3.
        5) Under paragraph 3.05 Assembly of Operations and Maintenance Manuals, all items shall be organized as specified.
    c. Training Session Submittal Format.
        1) Refer to Section 01 7900 - Demonstration and Training.

B. Project Record Documents: Submit documents to and secure approval from Architect prior to request for final Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. All record documents shall be maintained on site in digital format; record actual revisions to the Work, including but no limited to:
    1. Drawings.
    2. Specifications.
    3. Addenda.
    4. RFIs.
    5. Change Orders and other modifications to the Contract.
    6. Reviewed shop drawings, product data, and samples.
    7. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Contractor shall maintain and protect the record documents with backups and/or any other means necessary to ensure the integrity of the digital files.

D. In the event of loss of recorded data, use means necessary to again secure the data to the Architect's approval.
   1. Such means shall include, if necessary in the opinion of the Architect, removal and replacement of concealing materials.
   2. In such case, provide replacements to the standards originally required by the Contract Documents.

E. Record information concurrent with construction progress. Record Documents shall be current and submitted with each pay application.

F. Specifications: 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.

G. Record Drawings and Shop Drawings: Mark each item to record actual construction including:
   1. On the cover sheet of the Project Manual and the Drawings, provide the following statement, “RECORD DOCUMENTS- The changes noted herein are indicated in color and are designated by a revision delta (RD). The changes are recorded by [Contractor Name], [Date].”
   2. Prior to construction, insert all addenda to the record documents, both drawings and specifications as modified.
   3. Making entries on Drawings.
      a. Using colored markings, clearly describe the change by graphic line and note as required.
      b. Date all entries.
      c. Call attention to the entry by a "cloud" drawn around the area or areas affected. Add delta triangle with the letters “RD” inside the triangle.
      d. In the event of overlapping changes, use different colors for the overlapping changes.
   4. In addition to field changes, mark the record documents with areas modified by RFIs and change orders and hyperlink to the corresponding data.
   5. Schematic layouts.
      a. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items, are shown schematically and is not intended to portray precise physical layout.
      b. Clearly identify the item by accurate note such as "cast iron drain," "copper water", and the like.
         1) Show, by symbol or note, the vertical location of the item ("under slab", "in ceiling plenum," "exposed," and the like).
         2) Make all identification sufficiently descriptive that it may be related reliably to the Specifications.
   6. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   7. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   8. Field changes of dimension and detail.
   9. 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. Do not use Project Record Documents as maintenance drawings.

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. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. 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. Refer to Divisions 21, 22, 23, 26, 27 and 28 for system requirements.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into organized file folders 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 folder for each system.

C. Cover: Identify each USB Flash Drive with the title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

D. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants,Contractor and subcontractors, with names of responsible parties organized by division with project scopes listed for each company.

E. Tables of Contents: List every item using the same identification as on the content section and hyperlinked accordingly; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

F. Contents: Prepare final project record closeout documents for delivery to Owner in PDF file format as follows:
   1. FILE FOLDER: XXXX-XX OWNER'S NAME - PROJECT NAME - CLOSEOUT SUBMITTAL
      a. FILE FOLDER: 01 Table of Contents
         1) PDF File: Table of Contents
      b. FILE FOLDER: 02 Project Directory
         1) PDF File: Project Directory (organized as below):
            (a) Design Team
            (b) General Contractor
            (c) Sub-Contractors and Principal Vendors (organized by Division with project scope(s) listed for each Company)
      c. FILE FOLDER: 03 Contract Forms (organized and titled as below):

1) PDF FILE: Substantial Completion, AIA G704
2) PDF FILE: Payment and Performance Bond
3) PDF FILE: Certificates of Liability Insurance
4) PDF FILE: Contractor's Affidavit of Payment of Debts and Claims, AIA G706
5) PDF FILE: Contractor's Affidavit of Release of Liens, AIA G706A
6) PDF FILE: Consent of Surety to Final Payment, AIA G707
7) PDF FILE: Contractor and Sub-contractors' Release or Waiver of Liens
8) FILE FOLDER: Change Orders
   (a) PDF FILES: (separate files for each Change Order, organized and titled in numerical order)

d. FILE FOLDER: 04 Certifications and Inspections (organized and titled as below):
1) PDF FILE: The correspondence from the Geotechnical Engineer, required by Section 01 1400 at the beginning of construction, indicating that the Construction Documents conform with their recommendations.
2) PDF FILE: The correspondence from the Special Inspection and Testing Agency (SITA), required by Section 01 1400 at the beginning of construction, indicating that the SITA accepted the responsibility to perform the specified SITA scope and meet the specified SITA qualifications
3) PDF FILE: The correspondence from the Commissioning Agent (CxA), required by Section 01 1400 at the beginning of construction, indicating that the CxA accepted the responsibility to perform the specified SITA scope and meet the specified SITA qualifications
4) PDF FILE: The "Acknowledgement of Contractor's Responsibilities Related to Code-Required Quality Control" required by Section 01 4533 at the beginning of construction.
5) PDF FILE: The meeting minutes from the Quality Control Pre-Construction Meeting, with a list of all attendees.
6) PDF FILE: The Peer Review reports required by Section 01 1400, addressed to the AHJ, indicating that the contract document and all addenda have been reviewed for conformance with the Chapters required by ICC 500-2014.
7) PDF FILE: The written verification required by Section 01 1400 that the School Safety and Security Committee indicated that the contract documents were acceptable with regards to the planning and intended operations and maintenance of the facility.
8) PDF FILE: A copy of the notarized installation certification from the Storm Door and Shutter Installer, as required by Section 08 3906.
9) PDF FILE: A copy of the notarized installation certification from the Storm Louver Installer, as required by Section 08 9129.
10) PDF FILE: A copy of the notarized installation certification from the Storm Window Installer, as required by Section 08 4333.
11) PDF FILE: A copy of the written correspondence from the Contractor to the AHJ submitting the "Final Reports of Quality Control" required by Section 01 4533 from the SITA, CxA, and Code-Required Structural Observer. The copy of this correspondence shall include the actual reports and not just be a cover letter.
12) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the SITA
13) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the CxA
14) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Code-Required Structural Observer
15) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Structural Engineer

16) PDF FILE: The “Final Report of Quality Control” required by Section 01 4533 from the Mechanical Engineer
17) PDF FILE: The “Final Report of Quality Control” required by Section 01 4533 from the Electrical Engineer
18) PDF FILE: The list of attendees at the School Safety and Security Committee Walk-Through of the Tornado Shelter, as required by Section 01 1400.
19) PDF FILE: Certificates of Occupancy
20) PDF FILE: TEA Certificate of Project Compliance. File may be downloaded at https://tea.texas.gov/sites/default/files/cert_pre2004.pdf. Sample form is attached following this Section.
21) PDF FILE: Final Fire Inspection
22) PDF FILE: Final Health Inspection
23) PDF FILE: Final Elevator Inspection
24) PDF FILE: Final Building Inspection
25) PDF FILE: Accessibility Review Report
26) PDF FILE: Energy Code Compliance Letter
27) PDF FILE: HVAC Test and Balance Reports
28) PDF FILE: Backflow Test Report
29) PDF FILE: Data Testing Results
30) FLW FILE: Data Testing Results (Native)

e. FILE FOLDER: 05 Health/Safe Environment Data (organized and titled as below):
   1) PDF FILE: Asbestos-, Lead- and Hazardous-Free Material Certificates or Letter
   2) PDF FILE: Material Safety Data Sheets (MSDS) (organized by Division)
   3) PDF FILE: Indoor Air Quality Test Reports
f. FILE FOLDER: 06 Additional Project Information
   1) FILE FOLDER: Requests for Information
      (a) PDF FILES (separate files for each RFI, organized and titled in numerical order)
   2) FILE FOLDER: Requests for Proposals
      (a) PDF FILES (separate files for each RFP, organized and titled in numerical order)
   3) FILE FOLDER: Approved Submittals
      (a) PDF FILES (separate files for each Submittal, organized and titled in numerical order by specification section)
g. FILE FOLDER: 07 Attic Stock
   1) PDF FILES: Attic Stock Sign-Off Sheets (separate files for each, showing Owner receipt, and organized and titled in numerical order by Specification Section)
h. FILE FOLDER: 08 Demonstration and Training
   1) FILE FOLDER: Sign-In Sheets
      (a) PDF FILES: (separate files for each, organized and titled in numerical order by Specification Section)
   2) FILE FOLDER: Training Videos
      (a) All training videos organized and titled in numerical order by Specification Section
i. FILE FOLDER: 09 Project Record Documents
   1) PDF FILE: Project Record Specifications Manual (organized and bookmarked by Division and by Specification Section) - include and hyperlink all Addenda, RFIs, RFPs, and In-Field Changes stamped as "As-Built" or "Record Documents".
   2) PDF FILE: Project Record As-Built Drawings (organized and bookmarked by Sheet Number) - include and hyperlink all Addenda, RFIs, RFPs, and In-Field Changes stamped as "As-Built" or "Record Documents".
j. FILE FOLDER: 10 Warranties

1) FILE FOLDERS: (separate file folders, organized and titled by Division)
   (a) PDF FILES: (all warranty PDF files organized under each Division file folder and titled by Company Name)
   (b) PDF FILE: List of all warranties extending past one year. Include company name and contact information.

k. FILE FOLDER: 11 Operation and Maintenance Manuals
   1) PDF FILE: Keying Schedule
   2) PDF FILE: Shop Drawings (separate files for each, organized and titled by Specification Section)
   3) FILE FOLDER: Manuals
      (a) FILE FOLDERS: (separate file folders, organized and titled by Division)
      (b) PDF FILES: (all Manuals PDF files organized under each Division file folder and titled by Specification Section and scope)

3.06 CHANGES SUBSEQUENT TO ACCEPTANCE

A. The Contractor has no responsibility for recording changes in the Work subsequent to Final Completion, except for changes resulting from work performed under Warranty.

3.07 CERTIFICATION OF PROJECT COMPLIANCE

CERTIFICATION OF PROJECT COMPLIANCE	Completion of this form is required under provisions of 61.1036(c)(3)(F) TAC for all public school district construction projects.

1. PROJECT INFORMATION DISTRICT:

Facility: ARCHITECT/ENGINEER:

Address: CONTRACTOR/CM:

City: CONTRACT DATE:

DATE DISTRICT AUTHORIZED PROJECT:

BRIEF DESCRIPTION OF PROJECT:

2. CERTIFICATION OF DESIGN AND CONSTRUCTION

The intent of this document is to assure that the school district has provided to the architect/engineer the required information and the architect/engineer has reviewed the School Facilities Standards as required by the State of Texas, and used his/her reasonable professional judgment and care in the architectural/engineering design and that the contractor has constructed the project in a quality manner in general conformance with the design requirements and that the school district certifies to project completion.

3. The District certifies that the educational program and educational specifications of this facility along with the identified building code to be used have been provided to the architect/engineer.

DISTRICT: **BY:** **DATE:**

4. The Architect/Engineer certifies the above information was received from the school district, and that the building(s) were designed in accordance with the applicable building codes. Further, the facility has been designed to meet or exceed the design criteria relating to space (minimum square footage), educational adequacy, and construction quality as contained in the School Facilities Standards as adopted by the Commissioner of Education, July 9, 2003, and as provided by the district.

ARCHITECT/ENGINEER: **BY:** **DATE:**

5. The Contractor certifies that this project has been constructed in general conformance with the construction documents as prepared by the architect/engineer listed above.

CONTRACTOR/CM: **BY:** **DATE:**

6. The District certifies completion of the project (as defined by the architect/engineer and contractor).

DISTRICT: **BY:** **DATE:**

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and requiring routine maintenance where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Landscape irrigation.
   7. Audio and Visual systems.
   8. Lighting systems.
   9. Security systems and Access Controls.
   10. Fire Alarm systems.
   11. Kitchen Equipment.
   12. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Architect and Forney ISD.
   2. Submittals indicated as "Draft" are intended for the use of Owner in preparation of overall Training Plan; submit in editable electronic format, latest version of Microsoft Word required.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit not less than four weeks prior to start of training.
   2. Revise and resubmit until acceptable.
   3. Provide an overall schedule showing all training sessions.
   4. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.

h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
1. Identification of each training session, date, time, and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
4. Include Forney ISD's formal acceptance of training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.
3. Provide sign-off sheets in the closeout documents indicating the individuals who were in attendance at each of the training sessions.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.
2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Forney ISD.

D. Provide training in minimum two hour segments.

E. The Forney ISD is responsible for determining that the training was satisfactorily completed.

F. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

G. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

H. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

I. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

J. Contractor must have written approval from the Owner and Architect to forgo any required trainings.

END OF SECTION

SECTION 03 1000
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete.

B. Form accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing.

B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

D. ACI 347R - Guide to Formwork for Concrete; 2014.

E. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

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

B. Product Data: Provide data on void form materials and installation requirements.

C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, arrangement of joints and ties and minimum soil retainer bearing lengths above the bottom of the grade beam and below to bottom of the void as calculated per the formwork accessories section below.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.

B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

C. Protect plastic foam products from damage and exposure to sunlight.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Comply with relevant portions of ACI 301, ACI 301, and ACI 301.

2.02 WOOD FORM MATERIALS

A. Wood forms for unexposed concrete surfaces - No. 2 Common Southern Yellow Pine Lumber or other material of equal qualifications of sufficient thickness to be capable of sustaining the loads to be imposed thereon, dressed to uniformly smooth contact surfaces.

B. Wood forms for exposed concrete surfaces - Commercial Standard Douglas Fir, moisture-resistant, concrete form plywood with one smooth face.

2.03 PREFABRICATED CARTON VOID FORMS

A. Manufacturers:
   1. SureVoid Products, Inc: www.surevoid.com.
   2. Substitutions: As approved by the Engineer.

B. Carton Void Forms
   1. Function: used to create a space directly under structural concrete slab. Capable of sustaining all vertical and lateral loads applied until loads can be supported by concrete structure.
   2. Composition: corrugated paper material with a moisture resistant exterior, and having an interior fabrication of a uniform, cellular configuration, composed of non-wax impregnated biodegradable components.
   3. Depth: As indicated on the Structural Drawings.
   4. Profile: rectangular shape in cross-section.
   5. Strength: capable of sustaining a working load of 1000 psf.
   6. Accessories: of same composition and strengths as slab void forms.

C. Protective Cover Board: 1/8” thick masonite with no sheets overlapping and chairs at edges to stabilize.

D. Expandable Foam: Expandable spray foam shall be installed at all gaps in the void form system, but shall not prohibit proper concrete cover around rebar.

2.04 FORMWORK ACCESSORIES

A. Formwork shall consist of steel or wood forming where it is required to form concrete, except under gradebeams and slabs where carton void forms are shown on the construction drawings. Where carton void forms are shown, it is acceptable to either use carton void forms or use temporary steel or wood forming that is to be removed. If steel or wood forming is used where carton void forms are shown on the construction drawings, a void space shall be created below the concrete to match the specified carton void form dimensions.

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
   1. Composition: Colorless mineral oil-based compound.

C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

D. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751, 1/2 inch thick and full depth of slab less 1/2 inch .

E. Soil Retainers: Shall be provided where specified and shown on the drawings to prevent migration of backfill under suspended foundation elements.

F. Retainers shall be composed of high density polyethylene materials that are not adversely affected by moisture. They must be flexible, impact resistant and have sufficient strength to resist lateral loads applied by soil.

1. Unless noted otherwise in the Geotechnical Report, soil retainers shall extend a minimum of the minimum Manufacturer recommended distance above the bottom of the grade beam plus the Potential Vertical Movement (PVM) or Potential Vertical Rise (PVR) of the soil and the minimum Manufactorer recommended distance below the void space plus the PVM or PVR. Reference the General Notes on the Structural Drawings for the PVM/PVR. When determining the soil retainer height, it is permitted for the Manufactorer to provide a minimum height that does not already account for some degree of expansive soil movement as their recommended minimum, and the add the expansive soil movement specified here to that minimum height to determine the final specified soil retainer height. In the submittal, the Manufactorer shall state whether their recommended minimum height already includes expansive soil movement. Soil retainers shall not be attached to concrete. Waler ties shall be twisted off to allow soil retainers to rise the specified void depth.
2. Use 3/8" thickness for void spaces 8" and less. Use 1/2" thickness for void spaces greater than 8" but less than 12". Use 3/4" thickness for void spaces equal to 12". Soil retainers shall be equal to the following:
    a. BackFill Retainer by SureVoid Products, Inc. (installing this product vertically as recommended by the manufacturer)
    b. Subsititutions: See section 01 6000 - Product Requirements.
3. For void spaces greater than 12" but less than or equal to 16", retainers shall be ribbed and made from high density polyethylene. Soil retainers shall be equal to the following:
    a. Motzblock by M&M Construction specialties (installing this product at an angle as recommended by the manufacturer)
    b. SureRetainer by VoidForm Products, Inc. (installing this product at an angle as recommended by the manufacturer)
    c. Substitutions: See section 01 6000 - Product Requirements.

G. Waterstops: See section 03 3000 - Cast-in-Place Concrete.

H. Expanded Polystyrene (EPS) Geofoam:
1. Lightweight expanded polystyrene with a minimum compressive strength of 2.2 pounds per square inch (psi) at a 1% deformation.
2. Geofoam shall be in compliance with ASTM D 6817.
3. Geofoam shall be shaped to provide continuous support for raised slabs or to act as a lightweight fill material at locations indicated on the drawings.
4. Manufacturers:
    a. Foam-Control EPS Geofoam, AFM Corporation: www.geofoam.com
    b. InsulFoam GF, Insulfoam, LLC.: www.insulfoam.com
    c. Therma Foam: www.thermafoam.com

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms are not permitted.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Refer to the Civil Drawings for construction joint requirements at flatwork.

E. Construction joints for Structural concrete: Contractor shall obtain written approval for all construction joints not shown on Drawings for structural concrete. The Contractor shall locate construction joints in grade beams as shown on the Structural Drawings, with keyways and continuous reinforcement through the joint. The Contractor shall not be permitted to install a construction joint in any structurally suspended slabs unless less the joint is located over a grade beam providing a minimum of 4 inches of bearing on each side of the grade beam and unless the Architect approves of the location, which generally is acceptable if the joint is primarily located at least 1 inch under a wall. Slab construction joints shall not have a keyway and shall have continuous slab reinforcement running through the joint.
   1. If the Contractor desires to reduce the size of a slab pour, the Contractor shall be required to, at no additional cost to the Owner, install concrete shoring grade beams along the proposed construction joint. The grade beam shall be a minimum of 14 inches wide and minimum 24 inches deep with 3 #8 top and bottom and #3 stirrups at 10 inches on center. The grade beam shall be supported by deep foundation elements which the Contractor lowers as required to accommodate the new grade beam or by new deep foundation elements installed solely to support the CJ grade beam so that the grade beam is supported by deep foundation elements, using the Typical DFE Detail, at a maximum of 15 feet on center, (although additional deep foundation elements would not likely be required).

F. Construction joints: Locate construction joints in concrete as indicated. Contractor shall obtain written approval for all construction joints not shown on Drawings for structural concrete. Distance between construction joints shall be arranged so that the greatest horizontal dimension (including diagonal measurement) for slab pours shall not exceed 200 feet. Provide keyways and extra dowels at all joints. Provide longitudinal keys at joints.

G. Expansion joints: Expansion joints shall consist of joint fillers with sealant. Install filler strips 3/4" below finished surfaces. Clean grooves when surface is dry of foreign matter, loose particles and concrete protrusions; then fill approximately flush with joint sealant to be slightly concave after drying. Finish edges of exposed concrete along expansion joints around all fixed objects within or abutting concrete.

H. Void spaces:
   1. Contractor shall be solely responsible for providing void spaces of full size and extent shown on the drawings and install in accordance with manufacturer's recommendations.
   2. An 1/8" thick masonite sheet shall be placed on the void forms and below vapor barrier. Sheets shall be butted against each other, not overlapped, and all sheet corners shall be stapled to the void forms under the masonite.
   3. Void forms shall remain dry and undamaged prior to concrete placement. Damaged pieces shall be replaced prior to concrete pour.
   4. The void forms shall be placed in the largest pieces practical while adequately securing in place. All joints and exposed ends shall be sealed to prevent leakage of concrete into the void space.
   5. Contractor shall provide evidence satisfactory to the structural engineer that proper void spaces have been provided.

I. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect/Engineer before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

B. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

3.06 FIELD QUALITY CONTROL

A. A special inspections and testing agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

C. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.07 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 1119
INSULATING CONCRETE FORMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating concrete forms: Modular unit formwork system for cast-in place concrete walls; formwork designed to remain in place after concrete work is complete.

B. Shoring, bracing and anchorage.

C. Openings for other work.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 1400 - Work Restrictions: Work Restrictions related to the Tornado Shelter

B. Section 03 1000 - Concrete Forming and Accessories: Conventional concrete forms designed to be removed after concrete is poured and related accessories.

C. Section 03 2000 - Concrete Reinforcing: Reinforcing steel to be placed at the same time as formwork specified in this section.

D. Section 03 3000 - Cast-in-Place Concrete: Concrete to be placed into formwork specified in this section.

E. Section 05 1200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

F. Section 05 2100 - Steel Joist Framing: Placement of embedded steel anchors, plates and joist seats in cast-in-place concrete.

G. Section 07 2500 - Weather Barriers

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.

B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

C. ACI 347R - Guide to Formwork for Concrete; 2014.

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

E. ASTM C203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation; 2005a (Reapproved 2012).

F. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2017a.

G. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2018.

H. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.

I. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016.

J. ASTM D1622/D1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2020.

K. ASTM D1761 - Standard Test Methods for Mechanical Fasteners in Wood; 2012.

L. ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging; 2015.

M. ASTM D2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics; 2016.

N. ASTM D2863 - Standard Test Methods for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index); 2017.

O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

P. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

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

B. Product Data: Provide data form materials and installation requirements.

C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

D. Shop Drawings: Wall reinforcement.

E. The Insulating Concrete Forms Subcontractor shall provide shop drawings for the structural design parameters shown in the specifications and the construction drawings that have been designed by Huckabee.

F. Submit copy of manufacturer’s product installation manual.

G. Submit copy of valid product evaluation report for applicable code jurisdiction of ICC-ED (ER-6163.)

1.06 QUALITY ASSURANCE

A. Contractor shall engage a trained Installer for the duration of the work under this Section.

B. Installer’s Qualifications: Must show proof of three years of experience in installing this product and meet Manufacturer’s qualifying criteria. Installer shall furnish proof of training documentation to Contractor prior to commencement of work under this Section. Installer must have a documented history of successful ICF installations of large projects of a similar commercial nature.

C. ICF installer shall submit, as part of his qualifications, a time schedule for the erection of each phase of the work and the number of crews intended to be utilized to meet the schedule.

D. Manufacturer’s Qualifications: Must show continuous manufacturing of this product for a minimum of five years.

E. Maintain one copy of each installation standard on site throughout the duration of concrete work.

F. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver insulating concrete form system units and accessories with manufacturer's printed installation instructions and in manufacturer's original packaging.

B. Protect insulating concrete form system units and accessories from exposure to sunlight.

C. Material in contact with the ICF form must be compatible with expanded polystyrene.

D. Installer to meet with Contractor prior to material delivery on site to co-ordinate access, storage area, and protection of ICF product and accessories.

E. Store insulating concrete form system units off ground in ventilated and protected manner to prevent damage and deterioration from moisture.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nudura Corporation: www.nudura.com

B. BuildBlock Building Systems, LLC: www.buildblock.com

C. Fox Blocks: www.foxblocks.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FORMWORK - GENERAL

A. Provide insulating concrete forms, accessories, shoring, and bracing as required to accomplish insulated cast-in-place concrete work.

B. Wall shoring systems and placement procedures shall be in accordance with the Manufacturer's recommendations and that Contractor shall be responsible for hiring a Professional Engineer if appropriate as the Contractor shall be responsible for this work as part of the means and methods of construction. Huckabee has designed the wall only for permanent in-place conditions and has not designed the ICF for any construction conditions.

C. Comply with applicable state and local codes with respect to design, fabrication and erection of formwork.

D. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

2.03 INSULATING CONCRETE FORMS

A. Performance Requirements:
   1. Thermal Insulance, R-value, of Assembled System: Calculated thermal insulance when tested in accordance with ASTM C177.
      a. Wall System: 22 deg F hr sq ft, minimum.
   2. Sound Transmission Class, Assembled Wall Units: 49, minimum; based on assembly composed of two rigid foam boards separated by an 6 inch concrete core with a stucco exterior and 5/8 inch thick drywall interior.

B. Insulating Concrete Form Units for Walls: Rigid, expanded polystyrene boards; boards connected horizontally with injection--molded polypropylene webs and vertically by means of interlocking edges.
   1. Board Thickness: 2-5/8 inches . (basis of design)
   2. Concrete Core Thickness: 4 inches (101.6 mm), 6 inches (152.4 mm), 8 inches (203.2 mm), 10 inches (254 mm), and 12 inches.
      a. Core thickness as shown on the drawings.
      b. If a thickness is not shown on the drawings, the default shall be 8”. Contractor to coordinate with contract documents and verify wall thickness with structural engineer prior to proceeding with the work where thickness is not shown.
   3. Unit Types:
      a. Reversible straight form.
      b. Reversible 90 degree corner.

c. Reversible 45 degree corner.
d. Brick ledge.
e. Tapered top.
f. End cap.
g. " T " units.
h. Height-adjustable.
i. Radius.

2.04 COMPONENTS

A. Expanded Polystyrene (EPS) Insulation Board, General: Comply with the minimum requirements of ASTM C578, Type II and the specified characteristics below.
1. Density: 1.35 pounds per cubic foot when tested in accordance with ASTM D1622/D1622M.
2. Compressive Strength: 15 psi when tested in accordance with ASTM D1621.
3. Flexural Strength: 35 psi when tested in accordance with ASTM C203.
4. Water Absorption: 3.0 percent by volume, maximum.
5. Dimensional Stability: 2.0 percent, maximum, when tested in accordance with ASTM D2126.
6. Oxygen Index: 24 percent by volume, minimum, when tested in accordance with ASTM D2863.
7. Flammability; when tested in accordance with ASTM E84:
   a. Flame Spread: 25 or less.
   b. Smoke Developed: 450 or less.

B. Expanded Polystyrene (EPS) Insulation Boards: Comply with the minimum requirements of ASTM C578, Type II and the specified characteristics below.
1. Thermal Resistance: R-value of 4.0 deg F hr sq ft/Btu, minimum, when tested at 1 inch thickness in accordance with ASTM C177.
2. Water Vapor Permeance: 3.5 perms, maximum, when tested at 1 inch thickness in accordance with ASTM E96/E96M.
3. Tolerances:
   a. Edge and Face Trueness: 0.03 inch/ft, maximum.
   b. Length and Width Squareness: 0.06 inch/ft, maximum.

C. Injection Molded Polypropylene Ties and Profiles:
1. Wall system cross ties to provide minimum 1-1/2” wide furring strips at 12” maximum on center spacing, recessed 1/2" below the surface of the form face, to facilitate finish fastening both interior and exterior.
2. Tensile Strength: 253.3 pounds when tested in accordance with ASTM D638.
3. Ignition Temperature: 400 degrees F.
4. Burn Rate: 0.80 inch per minute when tested in accordance with ASTM D635.
5. Smoke Density: 25.9 percent maximum when tested in accordance with ASTM D2843.
6. Fastener Resistance; ASTM D1761:
   a. Type S Fine Thread Drywall Screw Withdrawal Load: 39.61 pounds.
   b. Type S Fine Thread Drywall Screw Lateral Resistance Load: 60.22 pounds.
   c. Type W Coarse Thread Drywall Screw Withdrawal Load: 38.42 pounds.
   d. Type W Coarse Thread Drywall Screw Lateral Resistance Load: 50.56 pounds.

D. Accessories: Provide the manufacturer's standard items listed below.

1. Veneer Anchors for all types of Veneer attached to ICF wall systems, Including Metal Panel Veneer Systems: It shall not be permitted to rely on ICF unit web components (e.g. plastic flanges buried in the insulating formwork) for structural anchorage of masonry veneers. Refer to Specification Section 04 2000, for specific requirements to either use a Reward TIE-KEY anchor embed or 2-Seal single screw veneer tie to receive adjustable veneer anchors.
2. Anchor bolts, anchor straps or inserts.
3. Internal bracing and alignment.
4. Door and window block outs.
5. Sleeves for wall penetrations.
6. Protective Tape for protection of exposed top of wall.
7. Fiber Tape
8. Low Expansion Foam for securing the forms to the foundation, infill around penetrations and blockouts.

2.05 MATERIALS

A. Provide and Install Concrete, for Use with insulating Concrete Forms: Comply with the applicable requirements of Section 03 3000 and specific requirements as shown in approved submittal documents.

B. Provide and Install Reinforcing Steel: Comply with the applicable requirements of Section 03 1000. Size, material grade, placement and spacing as shown on the structural drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with insulating concrete form work. Ensure that dimensions agree with drawings.

B. Verify placement of dowels and other anchors in foundations comply with the approved Contract Documents and the recommendations of the insulating concrete form manufacturer.

3.02 PREPARATION

A. Clean tops of footings and other foundation elements before starting formwork.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing as recommended by the manufacturer. Protect forms from damage.

B. Upon completion of leveling the forms, the contractor/installer shall secure the forms to the footing (footer) or slab using the low expansion spray foam on each side of the base form.

C. Erect formwork, shoring and bracing to achieve design requirements. Comply with applicable requirements of ACI 301.

D. Brace forms as recommended by manufacturer to ensure stability. Shore or strengthen formwork subject to overstressing by construction loads.

E. Align joints. Install units in running bond.

F. Ensure webs and attachment strips are properly aligned.

G. Install steel reinforcement as insulating concrete form work progresses and as indicated on the structural engineering drawings.

H. Install alignment system as recommended by manufacturer and as work progresses.

I. After completion of each concrete pour, cover the top of wall each day to protect and prevent moisture from entering the ICF wall until perminate covering is in place.

3.04 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Remove insulating concrete form material and provide sleeves or other means to create formed openings where required. Cut forms for utility penetrations as needed. Coordinate location of openings for items to be embedded in or pass through concrete work.

B. Openings exceeding 16” x 16” in area shall be reinforced.

C. Locate and set in place items that will be cast directly into concrete.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.05 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

3.06 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

B. Inspect insulating concrete form system, shoring, and bracing to ensure that work complies with the approved shop drawings and to verify that supports, fastenings, webs, alignment devices, attachment strips and other items are secure.

3.07 CLEANING

A. Clean forms as installation progresses. Remove dirt, dust, debris, excess material, etc. within forms.

B. Clean formed cavities and openings.

C. Flush completed forms with compressed air or water.
   1. If water is used, ensure that water and debris drain to exterior through clean-out ports and that formwork is free of standing water and dry before concreting begins.
   2. During weather cold enough that water could be reasonably expected to freeze, do not use water to clean out forms unless form installation and concreting proceed within a heated enclosure.

D. Remove snow and ice from within forms. Do not use de-icing salts or solutions.

END OF SECTION

SECTION 03 2000
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories.

B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.

B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

C. ACI SP-66 - ACI Detailing Manual; 2004.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

E. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.

F. CRSI (DA4) - Manual of Standard Practice; 2009.

G. CRSI (P1) - Placing Reinforcing Bars, 10th Edition; 2019.

1.04 SUBMITTALS

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

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, location of splices and embedded metal assemblies.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 318, ACI 318, ACI 301, ACI 318, and ACI 318.
   1. Maintain one copy of each document on project site.

B. Provide Architect with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

C. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Deformed billet-steel bars.
   2. Unfinished.
   3. Splicing of pier reinforcement shall not be permitted.

B. Weldable Reinforcing Steel: ASTM A 706, deformed low-alloy steel bars.

1. Unfinished.

C. Steel Welded Wire Reinforcement (WWR): Plain type; {\rs\#1} Plain type;.
   1. Form: Flat Sheets.

D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement. At slabs, supports shall not be further than 48 inches apart, each way.
   3. Provide plastic or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 FABRICATION

A. Fabricate concrete reinforcing in accordance with ACI SP-66 - ACI Detailing Manual.

B. Welding of reinforcement is not permitted, unless explicitly indicated on Structural Drawings

C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
   1. Review locations of splices with Architect.
   2. Approved patented type splices (No Electric Arc Welding Permitted) may be used instead of lap splices.
   3. Any bar may be field bent one time without notfiying the Structural Engineer, unless noted otherwise on the Structural Drawings. Reinforcement smaller than #4 bars shall be cold bent. Reinforcement greater than #4 bars shall be bent with heat in the field. Heating shall be controlled by temperature indicating crayons and shall reach a maximum temperature of 1500 degrees Farenheit. Reinforcement shall not be artificially cooled until temperature has reduced naturally to below 600 degrees Farenheit. Bends shall be gradual and care shall be taken to prevent heating or cracking of concrete. If reinforcement must be field bent more than once, the Contractor shall issue an RFI indicating which bars need to be field bent additionally.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Placement of reinforcing steel shall be done in cooperation with requirements of other trades. No cutting of reinforcement or displacement of bars shall be done by any of the trades without the consent of the Architect, and then only when adequate reinforcement is provided to replace the design requirements.

E. Use templates to locate all column and footing dowels.

F. Maintain concrete cover around reinforcing as indicated on drawings.

G. Bond and ground all reinforcement to requirements of Section 26 0526.

3.02 FIELD QUALITY CONTROL

A. A special inspections and testing agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete building frame members.

B. Concrete for composite floor construction.

C. Elevated concrete slabs.

D. Floors and slabs on grade.

E. Concrete Floor Topping and Feathering Material.

F. Joint devices associated with concrete work.

G. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, flagpole bases, thrust blocks, and manholes.

H. Concrete curing.

1.02 COORDINATION OF CIVIL AND STRUCTURAL CONCRETE SPECIFICATIONS

A. This specification section applies to all concrete designs provided on the Structural Drawings. For clarification, this specification section applies to interior and exterior concrete designs provided on the Structural Drawings (possibly including but not limited to sidewalks, patios, pavement, ramps, stairs, retaining walls, etc.). For exterior concrete designs not shown on the Structural Drawings but shown on the Civil Drawings, the provisions of this specification section only applies when there is not a conflicting specification elsewhere in in the Project Manual or Civil Drawings.

1.03 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 2000 - Concrete Reinforcing.

1.04 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

E. ACI 305R - Guide to Hot Weather Concreting; 2010.

F. ACI 306R - Guide to Cold Weather Concreting; 2016.

G. ACI 308R - Guide to External Curing of Concrete; 2016.

H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

I. ACI 347R - Guide to Formwork for Concrete; 2014.

J. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.

L. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2021.

M. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.

N. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

O. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.

P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

Q. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.

R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

S. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

T. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.

U. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004, with Editorial Revision (2013).

V. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a, with Editorial Revision (2013).

W. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

X. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

Y. ASTM F 1249

Z. COE CRD-C 48 - Method of Test for Water Permeability of Concrete; 1992.

AA. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.

BB. NSF 61 - Drinking Water System Components - Health Effects; 2017.

1.05 SUBMITTALS

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

B. The Contractor shall submit all proposed mix designs to the Architect for review before use. Each mix design shall clearly identify where the Contractor proposes use, such as indicating “Drilled Piers”, “Auger Cast-In-Place Piles”, “Concrete Columns”, “Insulating Concrete Formed Walls”, "Cast-In-Place Concrete Retaining Walls", "Precast Tilt Wall Panels", “Light Pole Bases”, “Grade Beams”, “Interior Slabs on Grade & Interior Slabs on Metal Deck”, “Interior Slabs on Void Boxes and Interior Slabs on Temporary Formwork”, “Exterior Slabs on Grade, Exterior Slabs on Metal Deck and Miscellaneous Concrete”, “Exterior Slabs on Void Boxes and Exterior Slabs on Temporary Formwork”, "Storm Shelter Roof Topping Slab", “Greenhouse Foundations”, “Freezer Slabs & Cooler Slabs”, “Crawlspace Mudslab”, etc. Failure to clearly identify where mixes are proposed for use is a suitable reason for rejection. To expedite approval it is suggested that all mix designs related to Structural items be submitted separately from all mix designs related to Civil items as these two categories are reviewed by different parties. Furthermore, to expedite approval, it shall be permitted to email Structural Mix Designs directly to the Structural Engineer or Record and request approval.

C. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, refer to Submission requirements below before products shall be permitted and provide letters of acceptance from the flooring subcontractor and provide data on method of removal in the event of incompatibility with floor covering adhesives.
   2. For vapor barriers, submit all of the following:

a. Product data and installation instructions.
b. Documentation from the manufacturer or patent-holder indicating that:
    1) The product is a minimum 15 mil product;
    2) The product is suitable for installation in contact with soil or granular fill under concrete slabs;
    3) Where a concrete-adhering tape is specified for use (e.g. over voidforms), both the vapor barrier product manufacturer or patent-holder and the concrete-adhering tape manufacturer or patent-holder have indicated that the concrete-adhering tape is compatible with the submitted vapor barrier product, and that test data indicates the tape will adhere to the concrete with a minimum 12 pounds per linear inch of tape.
c. Documentation from an independent agency indicating that:
    1) The independent agency is a testing firm or professional engineering firm which shares no ownership with the product manufacturer or patent-holder;
    2) The independent agency randomly selected the samples for testing from one or more warehouses (or other distribution locations) and then shipped the samples to one or more testing laboratories;
    3) Testing was completed within four years before construction proposals are due for this project, by one or more independent testing laboratories;
    4) The testing fully complied with ASTM E 1745 or identifying any deviations from ASTM E 1745 (including deviations from any documents referenced by ASTM E 1745), with permeance testing having at least two sample replicates (instead of the three required by ASTM E 1745) for each of the five permeance testing scenarios required (baseline and the four conditions required by ASTM E 154 Sections 8, 11, 12 and 13);
    5) The puncture, tensile strength and permeance results of the testing comply with the requirements for a 15 mil, Class A vapor barrier according to ASTM E 1745; and,
    6) The average permeance of all samples tested for each of the five permeance testing scenarios is less than or equal to 0.010 Perms [grains/(sq ft*hr*in.Hg)] (with the permeance results being considered to the nearest 0.001 Perm) per ASTM F 1249 or ASTM E 96 after mandatory conditioning tests per ASTM E 154 Sections 8, 11, 12 and 13.

D. Samples: Submit samples of underslab vapor barrier and tape to be used if making a substitution request.

E. Test Reports: Submit report for each test or series of tests specified.

F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

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

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
    1. Maintain one copy of each document on site.

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. Comply with requirements of Section 03 1000.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 2000.

2.03 CONCRETE MATERIALS

A. Cement: Varies by mix design (reference paragraph 3.13 for the mix schedule):
   1. Drilled Pier, Auger Cast in Place Pile, Light Pole/Flag Pole Bases, and Miscellaneous Concrete that is in contact with the soil: ASTM C150 Type II Portland or ASTM C595 Type IL with MS designation. Concrete mix shall have moderate sulfate resistance. For Type IL cements, Contractor shall submit ASTM C1012 test data that proves the cement meets the requirements for an MS designation.
   2. Grade Beam and Pilasters: Same as item 1 above. If the Contractor will be providing low sulfate (as defined by ACI 318) backfill against grade beams and pilasters, or will be providing protection from sulfate-rich soils per the typical detail in the Structural Drawings, then this mix does not require sulfate resistance and can use any ASTM C150 Type I/II Portland or ASTM C595 Type IL cement.
   3. All others: Any ASTM C150 Type I/II Portland or ASTM C595 Type IL cement.
   4. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.
   2. Fine aggregate:
      a. Provide washed natural or manufactured sand having strong, hard, durable particles, and containing not more than 2% by weight of deleterious matter such as clay lumps, mica, shale, or schist.
   3. Coarse aggregate:
      a. Provide coarse aggregate consisting of clean, hard, find grained, sound crushed rock or washed gravel, or a combination of both, containing not more than 5% by weight of flat, chip-like, thin, elongated, friable, or laminated pieces, nor more than 2% by weight of shale or cherty material.
      b. Use coarse aggregate of the largest practicable size for each condition of placement, subject to the following maximum size limitations:
         1) Do not exceed 3/4 of the clear distance between reinforcing bars, 1/5 of the narrowest dimension between sides of forms, or 1/3 the depth of any slab section.
      c. For each slab mix design submittal (excluding pavement designed by the Civil Engineer and shown on the Civil Drawings): The concrete supplier shall provide a combined (coarse and fine) sieve analysis for the proposed aggregate blend, using sieve data measured within the past 3 months. It shall be permitted for the concrete supplier to submit a combined sieve analysis that is calculated based on individual sieve analyses. The combined sieve analysis shall show the percent retained on each sieve (not the cumulative percent retained) and shall meet the following requirements:
         1) Sizes: 1", 3/4", 1/2", 3/8", #4, #8, #16, #30, #50, #100.
         2) No sized other than those listed shall be on the analysis.
         3) 0% to 5% shall be retained on the top (largest) size.
         4) 1.5% to 5% shall be retained on the #100 sieve.
         5) 2% to 20% shall be retained on all intermediate sieves.
         6) The percent retained on each intermediate sieve shall not be greater than 1.2 times the percent retained on any adjacent intermediate sieve.
         7) If the percent retained requirements above cannot be met by using multiple aggregate piles from the plant, the Contractor shall assume for bidding purposes that outside sources will be required.

8) Requests for variances are permitted to be submitted to the Engineer for consideration.

C. Lightweight Aggregate: ASTM C330/C330M.

D. Fly Ash: ASTM C618 C or F

E. Water: ASTM C94/C94M or potable.

F. Concrete Floor Topping and Feathering Material:
1. At feathered locations, provide cement-based self-leveling underlayment.
2. Provide manufacturer's recommended primer for standard absorbent concrete.
3. Aggregate shall be well graded, washed gravel (1/8" to 1/4" or larger) for use when underlayment is installed over 1 1/2" thick.
4. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).
5. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following manufacturers.
   a. Ardex Engineered Cements, 400 Ardex Park Drive; Aliquippa, PA; (724) 203-5000; www.ardex.com <http://www.ardex.com>.
   b. (Level-Right) Maxxon Corporation, 920 Hamel Road, Hamel, MN; (763) 478-9600; www.level-right.com <http://www.level-right.com>.
   c. Bonsal American, 8201 Arrowridge Blvd., Charlotte, NC 28224, (800) 738-1621; www.bonsal.com <http://www.bonsal.com>.
   d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Dispense in compliance with manufacturer's recommendations with particular attention to possible undesirable chemical reaction between products when mixed in concentrated form.

C. Air Entrainment Admixture: ASTM C260/C260M.

D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
1. Manufacturers:
   a. MasterGlenium 1466 by BASF Corporation.
   b. Substitutions: See Section 01 6000 - Product Requirements.

E. Mid-Range Water Reducing Admixture: Complying with ASTM C494/C494M Type A and/or Type F and having a maximum of 25% lignosulfonates.
1. Manufacturers:
   a. POLYHEED 1020 by Degussa Admixtures
   b. SIKAMENT 686 by Sika (214) 878-3669
   c. PLASTOL 341 by Euclid Chemical Co. (216) 531-9222
   d. POZZOLITH 200N by BASF Corporation
   e. MasterGlenium 1466 by BASF Corporation
   f. Substitutions: See Section 01 6000 - Product Requirements. A letter from the manufacturer will be required indicating that the material does not have more than 25% lignosulfonates.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Barrier shall meet all of the following requirements:
1. The product shall be a minimum 15 mil product.
2. The product shall be suitable for installation in contact with soil or granular fill under concrete slabs according to the manufacturer or patent-holder.

3. Within four years before construction proposals are due for this project, an independent agency (a testing firm or professional engineering firm which shares no ownership with the product manufacturer or patent-holder) shall have randomly selected the samples for testing from one or more warehouses (or other distribution locations) and then shipped the samples to one or more testing laboratories which then completed testing in compliance with ASTM E 1745 having at least two sample replicates (instead of the three required by ASTM E 1745) for each of the five permeance testing scenarios required (baseline and the four conditions required by ASTM E 154 Sections 8, 11, 12 and 13), with the puncture, tensile strength and permeance results of the testing complying with the requirements for a 15 mil, Class A vapor barrier according to ASTM E 1745, and the average permeance of all samples tested for each of the five permeance testing scenarios being less than or equal to 0.010 Perms [grains/(sq ft*hr*in.Hg)] (with the permeance results being considered to the nearest 0.001 Perm) per ASTM F 1249 or ASTM E 96 after mandatory conditioning tests per ASTM E 154 Sections 8, 11, 12 and 13.
4. Accessory Products: At slabs on grade and over the subgrade of all crawlspaces, install vapor barrier manufacturer's recommended tape for sealing seams and penetrations in vapor barrier. At slabs poured over carton void forms, install the vapor barrier over the Masonite and tape all joints (and tape the perimeter of the vapor barrier under the slab area) with a concrete-adhering tape that bonds to the concrete with a minimum tensile strength of 12 pounds per linear inch. A letter or other documentation from the manufacturer or patent-holder of the vapor barrier and the manufacturer or patent-holder of any concrete-adhering tape required for this project shall be submitted to the Architect indicating that both products are compatible. At all areas where vapor barrier is installed, install the vapor barrier manufacturer's recommended adhesive, mastic, prefabricated boots, etc.
5. At slabs over crawlspace, unless specifically noted otherwise, crawlspace shall consist of 3" thick unreinforced mud slab. If crawlspace grading indicates locations where mud slab in not required, provide vapor barrier noted above covered with 2" of 3/8" diameter pea gravel.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.

C. Waterstops: Self-sealing, non-swelling preformed joint sealant.
   1. Single component, self-sealing adhesive compound, extruded in a square cross-section between two quick-release protective wrappers.
      a. Meets Federal Specification SSS-210
      b. Certified NSF/ANSI Standard 61 for use in potable water systems
      c. Manufacturers:
         1) Henry Company; Synko-Flex Waterstop: www.us.henry.com
         2) Substitutions: See Section 01 6000 - Product Requirements.
   2. Flexible PVC Waterstop. Dumbell Configuration.
      a. Certified NSF/ANSI Standard 61 for use in potable water systems
      b. Manufacturers:
         1) Sika USA; Greenstreak Waterstop: usa.sika.com.
         2) Substitutions: See Section 01 6000 - Product Requirements.

D. Reglets: See Section 03 1000 - Concrete Forming and Accessories

E. Joint Filler: See Section 03 1000 - Concrete Forming and Accessories

F. Slab Construction Joint Devices: See Section 03 1000 - Concrete Forming and Accessories

2.07 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
   1. Manufacturers:
      a. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.

B. At all building slabs, except locations where a "sealer" is shown on the Architectural Drawings: Wet Curing with Potable Water that is not detrimental to concrete.
   1. Unless otherwise approved as a substitution request, Proposers shall assume for Proposal purposes that curing compounds shall not be used anywhere on this project and that only wet curing shall be permitted. However, if requested as a substitution request, the Architect may elect to permit this material at certain locations if the Contractor verifies that the warranty will be met: Curing Compound, Naturally Dissipating, Clear, water-based, liquid membrane-forming compound, that dissipates within 3 to 5 weeks; complying with ASTM C309.Note: Many flooring installer Subcontractors will no longer warranty flooring if any kind of curing compound is used! It is the Contractor's responsibility for verifying compatibility of flooring materials and adhesives with any proposed curing compound before proposing curing compounds.

C. At all building slabs where a "sealer" is shown on the Architectural Drawings: Curing and Sealing Compound, Semi-Gloss: Liquid, membrane-forming, dries clear, non-yellowing acrylic-based polymer; complying with ASTM C1315 Type 1 Class A.
   1. Vehicle: Solvent-based.
   2. Solids by Mass: 25 percent, minimum.
   3. VOC Content: Ozone Transport Commission (OTC) compliant.
   4. Manufacturers:
      a. BASF; MasterKure CC 250 SB: www.master-builders-solutions.basf.us
      b. W.R. Meadows, Inc.; CS-309-25 OTC: www.wrmeadows.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.08 CONCRETE MIX DESIGN REQUIREMENTS

A. Note to Building Official: The specified air contents for this project are based on the interpretation that all concrete on this project is under Exposure Category F0 conditions in which Freezing and Thawing concerns are "Not Applicable". The International Building Code requires that air contents of concrete be within ranges specified by ACI 318 for various Exposure Categories depending on the probability of exposure to moisture before freezing, and probability of cycles of freezing and thawing. ACI Commentary describes F0 as concrete that will not be exposed to cycles of freezing; F1, exposed to cycles of freezing and thawing that will be occasionally exposed to moisture before freezing; F2, exposed to cycles of freezing and thawing that is in continuous contact with moisture before freezing; and F3, similar to F2 with exposure to deicing chemicals. The "not applicable" interpretation for this project is based on the very limited number of freeze thaw cycles that are likely to occur at this project and based on the consideration that high air contents can cause problems such as cracking and surface delamination.

B. Refer to the schedule of mixes at the end of this specification section for requirements specific to different applications. It shall be permitted to submit to the Engineer any desired proprietary designs which deviate from the schedule of mixes if and only if all deviations from the schedule are clearly noted and if test data is provided indicating the performance of the concrete with regard to slump versus time, strength versus time, and air content.

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

D. Establish required average strength for each type of concrete on the basis of field experience, as specified in ACI 301. It shall be an obligation of the Contractor to produce and deposit concrete that will exceed specified strength twenty-eight days after placing. Concrete falling below specified strength required by ACI 318, as shown by cylinder test shall be removed by the Contractor and be replaced with concrete at specified strength at no cost to the Owner unless otherwise approved by the Engineer after evaluation.

E. Concrete may be proportioned and mixed at the job, dry-batched and mixed at the job or be procured from a ready-mixed concrete plant. Whatever the method of production, concrete materials and concrete shall be stored handled and mixed in conformance with all requirements of ASTM C94, which apply to the particular method selected.

F. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

G. Aggregate: As specified in Section 2.03 B.

2.09 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

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 Section 03 1000 - Concrete Forming and Accessories.

B. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.
   3. At intersections of pours for concrete walls and beams (including foundation elements such as grade beams), install a 1 1/2" deep keyway that is a minimum of 1/3 the thickness and 1/3 the height (unless otherwise noted) and roughen the exposed surface of the first pour with a minimum 1/4" amplitude.

C. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

D. Vapor Barrier: At exterior floor slabs where indicated on the Structural Drawings Sheets and Notes and at all interior floor slabs, a vapor barrier under the floor slab shall be installed in accordance with ASTM E 1643 and as indicated in Part 2 of this Specification Section. Lap joints minimum 6 inches. Repair damaged vapor retarder before covering.
   1. Install compactible granular fill before placing vapor barrier at areas where slabs are poured on grade. Install void boxes and masonite before placing vapor barrier at areas where slabs are to be poured on void boxes. Do not place sand between the vapor barrier and the slab.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of Section 03 2000 - Concrete Reinforcing.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Architect not less than 48 hours prior to commencement of placement operations.

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

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

3.05 SLAB JOINTING

A. Locate joints as indicated on 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.

D. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

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

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

G. 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.

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

I. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

J. Install joint device anchors for expansion joint assemblies specified in Section 07 9513. Maintain correct position to allow joint cover to be flush with floor and wall finish.

K. Apply sealants in joint devices in accordance with Section 07 9005.

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

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

N. Deposit concrete continuously or in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within sections.

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

P. Placing of concrete in supported elements shall not be started until concrete previously placed in columns and walls is no longer plastic.

Q. Consolidate concrete by vibration, spading or rodding, so that concrete is thoroughly worked around reinforcement, around embedded items and into corners or forms, eliminating all air or stone pockets that may cause honeycombing, pitting or planes or weakness.

R. Place saw-cuts in slabs-on-grade and topping slabs in saw cut pattern indicated. Saw-cuts in slab over void space are not permitted.

S. Saw cut slab-on-grade and topping slab joints within 4 hours after placing. Use maximum 3/16 inch thick blade, cut into slab 1/4 depth of slab thickness. Saw-cuts in slab over void space are not permitted.

T. Screed slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.06 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface and, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

B. Place required dividers, edge strips, reinforcing, and other items to be cast in.

C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

D. Apply sand and cement slurry coat on base course, immediately prior to placing toppings.

E. Place concrete floor toppings to required lines and levels.
   1. Place topping in checkerboard panels not to exceed 20 feet in either direction.

F. Screed toppings level, maintaining surface flatness of maximum 1:1000.

3.07 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
   3. Under Carpeting: 1/4 inch in 10 feet.

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.

3.08 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. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as indicated on drawings and as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
   2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
   2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   3. Other Surfaces to Be Left Exposed: "Steel trowel" as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
   4. Broom Finish: Ramps, stair treads, sidewalks, porches and docks, concrete pads and bases for mechanical equipment. Steel trowel smooth. Brush after troweling with a soft bristle broom to create non skid surfaces perpendicular to the direction of travel.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.09 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 seven days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

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 use of such materials is desired by the Contractor, the Contractor shall 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. Unless otherwise approved as a substitution request, the Contractor shall assume during bidding that curing compounds shall not be used anywhere on this project and that only wet curing shall be permitted. However, if requested by the Contractor as a substitution request or during construction, the Architect may elect to permit this material at certain locations. Generally, the Architect will require a letter from the flooring subcontractor guaranteeing that the curing compound is compatible with the flooring adhesive and flooring materials.
   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.
      a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
      b. Spraying: Spray water over floor slab areas and maintain wet.
      c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.

3.10 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

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

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

3.11 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 complying with 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.

3.12 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

3.13 SCHEDULE - CONCRETE MIX DESIGN REQUIREMENTS

A. "Drilled Pier" Mix: 3,000 psi 28 day concrete, maximum water to cement ratio of 0.5, 5" to 7" slump, 1.5% +/- 1.5% air content, air entraining agent not required, minimum 5 sacks of cement per cubic yard, up to 20% replacement using Class C or F fly ash permitted, mid or high range water reducing agents permitted.

B. "Augured Cast In Place Pile" Mix: 3,000 psi grout (with sand but not coarse aggregate) measuring grout strength by cubes (2"x2"x2") at 28 days, maximum water to cement ratio of 0.5, 10 to 25 second flow rate when using 3/4 inch opening in (Modified corps of Engineers) flow cone, 1.5% +/- 1.5% air content, air entraining agent not required, 0.50 maximum water/cement ratio, up to 20% replacement using class C or F fly ash permitted, mid or high range water reducing agents permitted. Mix shall meet all recommendations of the Deep Foundations Institute.

C. "Concrete Columns" Mix: If any portion of the concrete will be exposed outside the building lines, this mix design shall not apply. 3,000 psi 28 day concrete, 6" to 8" slump, 1.5% +/- 1.5% air content using air entraining agent, minimum 5 sacks of cement per cubic yard, fly ash not permitted, mid-range water reducing agents permitted, high-range water reducing agents not permitted.

D. "Insulating Concrete Formed (ICF) Walls" Mix: 4,000 psi 28 day concrete, 7" to 9" slump, 1.5% +/- 1.5% air content, air entraining agent not permitted, minimum 6 sacks of cement per cubic yard with up to 20% replacement of cement with Class C or Class F fly ash permitted, mid-range water reducing agents permitted, high-range water reducing agents not permitted. Maximum 3/8" coarse aggregate.

E. "Light Pole/Flag Pole Bases" Mix: 3,000 psi 28 day concrete, 6" to 8" slump, 4.5% +/- 1.5% air content using air entraining agent as required, minimum 5 sacks of cement per cubic yard, fly ash not permitted for any elements which are part of a building system (e.g. exterior columns), up to 20% replacement of cement with Class C or Class F fly ash permitted for other site elements such as light pole bases, mid range and high range water reducing agents permitted.

F. "Grade Beam and Pilasters" Mix: 3,000 psi 28 day concrete, 4" to 6" slump, 4.5% +/- 1.5% air content using air entraining agent as required, minimum 5 sacks of cement per cubic yard, up to 20% replacement of cement with Class C or Class F fly ash permitted. Mid range water reducing agents permitted, high range water reducing agents permitted.

G. "Interior Slabs on Metal Deck" Mix: 3,000 psi 28 day concrete, maximum water to cement ratio of 0.5, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 1.5% +/- 1.5% air content, air entraining agent not permitted, minimum 5 sacks of cement per cubic yard with up to 20% replacement using Class F fly ash permitted, mid range water reducing agents permitted, high range water reducing agents not permitted. The slab aggregate gradation requirements in Section 2.03 B shall apply. If any portion of concrete is will be permanently in contact with exterior elements, Miscellaneous Concrete mix design shall apply.

H. "Interior Slabs on Void Boxes and Interior Slabs on any other Temporary Formwork" Mix: 4,000 psi 28 day concrete, maximum water to cement ratio of 0.5, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 1.5% +/-1.5% air content, air entraining agent not permitted, minimum 6 sacks of cement per cubic yard with up to 20% replacement using Class C or F fly ash permitted, mid range water reducing agents permitted, high range water reducing agents not permitted. The slab aggregate gradation requirements in Section 2.03 B shall apply. Over permanent formwork (metal deck) above subfloor pressurized water lines within an area surrounded by slabs on void boxes, the concrete slab on formwork shall be poured integrally with the adjacent slabs on void boxes using this mix design.

I. "Miscellaneous Concrete" Mix: 3,000 psi 28 day concrete, maximum water to cement ratio of 0.50, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 4.0% +/- 1.5% total air content using air entraining agent, minimum 5 sacks of cement per cubic yard, up to 20% cement replacement using Class F fly ash permitted, Class C fly ash not permitted unless it also qualifies as a Class F fly ash, mid range water reducing agents permitted, high range water reducing agents not permitted. The slab aggregate gradation requirements in Section 2.03 B shall apply.

J. "Exterior Slabs on Void Boxes and Exterior Slabs on any other Temporary Formwork" Mix: 4,000 psi 28 day concrete, maximum water to cement ratio of 0.50, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 4.0 +/- 1.5% total air content using air entraining agent, minimum 6 sacks of cement per cubic yard, up to 20% cement replacement using Class C or F fly ash permitted, mid range water reducing agents permitted, high range water reducing agents not permitted. The slab aggregate gradation requirements in Section 2.03 B shall apply.

K. "Storm Shelter Roof Topping Slab" Mix: 4,500 psi 28 day concrete, maximum water to cement ratio of 0.50, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 1.5 +/- 1.5% total air content using air entraining agent, minimum 5 sacks of cement per cubic yard, up to 20% cement replacement using Class C or F fly ash permitted, mid range water reducing agents permitted, high range water reducing agents not permitted. (Note: this mix shall be normal weight concrete and shall not be aerated or have lightweight aggregate.)The slab aggregate gradation requirements in Section 2.03 B shall apply.

L. "Freezer Slabs and Cooler Slabs" Mix: 4,500 psi 28 day concrete, maximum water to cement ratio of 0.45, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 6.0% +/- 1.5% total air content using air entraining agent, minimum 6.5 sacks of cement per cubic yard, up to 20% cement replacement using Class F fly ash permitted, Class C fly ash not permitted unless it also qualifies as a Class F fly ash, mid range water reducing agents permitted, high range water reducing agents not permitted. The slab aggregate gradation requirements in Section 2.03 B shall apply.

END OF SECTION

SECTION 03 4100
PRECAST STRUCTURAL CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall panels.
B. Columns and bearing saddles.
C. Beams, spandrels, girders, purlins.
D. Roof double tees.
E. Grout packing.
F. Connection and supporting devices.
G. Lintels and bond beams.

1.02 RELATED SECTIONS

A. Section 01 1400 - Work Restrictions: Work Restrictions related to the Tornado Shelter
B. Secion 01 3000 - Administrative Requirements

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.
B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
C. ASTM A416/A416M - Standard Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete; 2018.
D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
F. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
G. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2015.
H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
I. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
J. PCI MNL-116 - Manual for Quality Control for Plants and Production of Structural Precast Concrete Products; 1999.
K. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988.
L. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; 2000.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Indicate standard component configurations, design loads, deflections, cambers, and bearing requirements.
C. Shop Drawings: Submit shop drawings signed by a licensed engineer indicating layout, unit locations, embedded component locations, fabrication details and unit identification marks,.
    1. Prepare shop drawings in accordance with pertinent provisions of Supplementary General Conditions of these Specifications and showing complete information for fabrication and erection of the work of this Section.

2. Precast Concrete panels, connection details, design criteria, engineered calculations, mix design, and reinforcement
3. Statement indicating that the Fabricator will not have any lifting inserts on any exposed concrete faces (excluding the shelter control room and the baffling chamber(s)).
    a. The Contractor shall provide the following written statement on the submittal after verifying that this statement is true. If the transmittal does not have this statement, the submittal shall be returned “revise and resubmit”; the Structural Engineer shall reserve the right, however, if he or she believes that this coordination has likely occurred and the omission was not intended, to return the submittal “exceptions noted” and note that the Contractor shall provide this verification before proceeding with work.
    “[Insert Contractor’s name] has submitted these shop drawings (not a former version of them as they were being developed) to the following Subcontractors and verified that these drawings correctly show all required openings/penetrations, anchors, and embedded elements associated with their scope of work.
        1) Storm Door/Shutter
        2) Storm Louver
        3) Storm Window
        4) HVAC
        5) Plumbing
        6) Electrical
        7) Fire Sprinkler
        8) Coiling Door
        9) Access Control
        10) Camera
        11) Equipment Installers (Basketball Goals, Scoreboards, etc…)”
    b. All components to be embedded in precast panels (e.g. electrical conduit, junction boxes, etc..). Conduit runs and junction box locations shall be indicated with a dashed line in precast panel elevation views and provide embedment depths for all conduit. precast panel that is to have components embedded within the panel. It shall be the Contractor’s responsibility to provide coordination between the appropriate individuals for each trade that is to have components embedded into the precast panel (e.g. electrical subcontractor, communications consultant, etc...)
    c. All openings in the precast panels shall be clearly indicated on plan. Openings for debris impact tested assemblies shall be sized the exact size of the component (e.g. exterior storm doors and louvers). Contractor shall be responsible for hand grinding rough openings to allowing for proper fit of doors and louvers in accordance with manufacturer’s specifications for code compliance and as detailed in the Contract Documents.
    d. The Precast panel drawings shall clearly indicate the dimensioned location of every anchor greater than ¾” that will be required. The Contractor’s Precast Concrete Engineer shall provide a written statement on the submittal verifying that anchors less than ¾” deep are structurally acceptable at any location and do not require approval by the Precast Concrete Engineer. Note: this does not apply for veneer anchors if the post-installed anchor solution is utilized as noted in specification section 04 2000. If post-installed veneer anchors are utilized, the Contractor's Precast Concrete Engineer shall provide a written statement verifying that anchors are permitted to penetrate up to 1 1/2". Additionally, the Precast Concrete Engineer shall be prepared to provide remediation for concrete that is damaged or spalled during the veneer anchor installation process.

e. Member dimensions and cross sections; locations, size, and type of reinforcement, including special reinforcement and lifting devices necessary for handling and erection; Thickness of walls and other elements shall be as shown on the drawings, not decreased or increased. The minimum thickness of concrete at the perimeter of the tornado shelter as defined by Sheet G3.1 shall in no instances be less than 4" reinforced with the equivalent of #4 at 12” on center each way, which is required for missile debris impact testing compliance.
f. Erection procedures, sequence of erection, and required handling equipment;
g. Layout, dimensions, and identification of each precast unit corresponding to the sequence and procedure of installation;
h. Welded connections, indicated by AWS standard symbols;
i. Details of inserts, connections, and joints, including accessories and construction at openings in the precast units;
j. Location and details of anchorage devices that are to be embedded in other construction.

4. Shop drawing sheets that inclde engineering information designed by the Contractor's Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor's Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.
5. Submit reviewed shop drawings and design data to authorities having jurisdiction for approval.

D. Design Data: Submit design data reports indicating calculations for loadings and stresses of fabricated, designed framing.

E. Fabricator's Qualification Statement: Provide documentation showing precast structural concrete fabricator is certified by the Precast Concrete Institute (PCI) or by both the Construction Certification Institue (CCI) and the National Precast Concrete Association (NPCA).

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design precast concrete members under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in Texas.

B. Fabricator Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years ofdocumented experience. Precast Concrete fabricator shall be certified by the Precast Concrete Institute (PCI) or by both the Construction Certification Institue (CCI) and the National Precast Concrete Association (NPCA).

C. Erector Qualifications: Company specializing in erecting products of this section with minimum three years of documented experience and approved by manufacturer.

D. Welder Qualifications: Qualified within previous 12 months in accordance with AWS D1.1/D1.1M and AWS D1.4/D1.4M.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle precast members in position consistent with their shape and design. Lift and support only from support points.

B. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.

C. Protect members to prevent staining, chipping, or spalling of concrete.

D. Mark each member with date of production and final position in structure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Structural Precast Concrete:
   1. Any manufacturer holding a PCI Group C Plant Certification for the types of products specified; see www.pci.org/find/manufacturer.
   2. Any manufacturer holding both CCI and NPCA certifications.

2.02 PRECAST UNITS

A. Precast Structural Concrete Units: Comply with PCI MNL-116, PCI MNL-120, PCI MNL-123, PCI MNL-135, ACI 318 and applicable codes.
   1. Design components to withstand dead loads and design loads in the configuration indicated on the drawings:
   2. The minimum compressive strength of wall panels shall be 4,500 psi at 28 days for compliance with debris missile impact testing specifications.
   3. Calculate structural properties of framing members in accordance with ACI 318.
   4. Replace Portland cement with fly ash per Section 03 3000.
   5. Design members exposed to the weather to provide for movement of components without damage, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to seasonal or cyclic day/night temperature ranges.
   6. Design system to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.
   7. The Contractor's Precast Concrete Engineer shall design the precast structural concrete elements so that it shall be permitted for post-installed anchors embedded up to ¾” deep to be installed at any location on any face of all precast elements, without it being required to notify the Precast Engineer.
      a. Exception: If post-installed veneer anchors are utilized, the Contractor's Precast Concrete Engineer shall design any walls to receive these veneer ties assuming up to 1 1/2" penetration. Additionally, the Precast Concrete Engineer shall be prepared to provide remediation for concrete that is damaged or spalled during the veneer anchor installation process.

2.03 MATERIALS

A. Cement: Gray Portland type, conforming to ASTM C150/C150M, Type I/II.

B. Aggregate, Sand, Water, Admixtures: Determined by precast fabricator as appropriate to design requirements and PCI MNL-116.

2.04 REINFORCEMENT

A. Tensioning Steel Tendons: ASTM A416/A416M, Grade 250 (1725); seven-wire stranded steel cable; low-relaxation type; full length without splices; weldless; uncoated.

B. Reinforcing Steel: ASTM A615/A615M, Grade [CHOICE TEXT]0 or greater.
   1. Deformed billet-steel bars.
   2. Unfinished.

C. Steel Welded Wire Reinforcement: ASTM A1064/A1064M plain type or deformed type; in flat sheets; unfinished.

2.05 FABRICATION

A. Coordinate with the General Contractor and all Subcontractors and Vendors as required to install components necessary and/or specified to be inside the wall panels. Specifically, all electrical conduit and accessories shall be embeded in the walls before pouing wall panels. And, specifically, all penetrations needed by others shall be accomodated during fabrication when locaing prestressing strands and anchors.

B. Refer to Sheet G3.1 for additional requirements for the tornado shelter quality assurance plan.

C. Comply with fabrication procedures specified in PCI MNL-116.

D. Fabricate and handle epoxy-coated reinforcing bars (if utilized) in accordance with ASTM D3963/D3963M.

E. Maintain plant records and quality control program during production of precast members. Make records available upon request.

F. Ensure reinforcing steel, anchors, inserts, plates, angles, and other cast-in items are embedded and located as indicated on shop drawings.

G. Tension reinforcement tendons as required to achieve design load criteria.

H. Provide required openings with a dimension larger than 10 inches and embed accessories provided under other sections of the specifications, at indicated locations.

I. Exposed Ends at Stressing Tendons: Fill recess with non-shrink grout, trowel flush where exposed to final view. at all other conditions, provide corrosion protection coating (e.g. mastic).

2.06 FABRICATION TOLERANCES

A. Comply with fabrication tolerances specified in PCI MNL-116, except as specifically amended below.
   1. Variation From Nominal Dimension: Plus or minus 1/2 inch.
   2. Variation From Intended Camber: Plus or minus 1/4 in per 10 ft, plus or minus 5/8 inch maximum.
   3. Variation from End Squareness: Plus or minus 1/8 inch/12 in, maximum 3/8 in.
   4. Maximum Misalignment of Anchors, Inserts, Openings: Plus or minus 1/8 inch.
   5. Sweep: Plus or minus 1/4 inch.

2.07 FINISHES

A. Ensure exposed-to-view finish surfaces of precast concrete members are uniform in color and appearance.

B. Cure members under identical conditions to develop required concrete quality, and minimize appearance blemishes such as non-uniformity, staining, or surface cracking.

C. Finish members to PCI MNL-116 Finish B grade.

2.08 ACCESSORIES

A. Connecting and Supporting Devices; Anchors and Inserts: Plates, angles, items cast into concrete,items connected to steel framing members, and inserts complying with PCI MNL-123 and as follows:
   1. Material: Carbon steel complying with ASTM A36/A36M.
   2. Finish: Unfinished.
   3. Provide connectors between wall panels at all walls in a plane for each and every plane of precast wall panels to act as a composite lateral force resisting system in each plane.

B. Grout: Non-shrink, non-metallic, minimum yield strength of 6,000 psi at 28 days.
   1. Type: Epoxy.

C. Cotton Duck Pad between 2 steel plate precast components cast into concrete with 1/2" minimum thickness.

D. Bolts, Nuts and Washers: High strength steel type recommended for structural steel joints.

E. Prime Paint: Zinc rich alkyd type.

F. Install minimum 26 gage dove tail channel anchor inserts or post-installed veneer anchors to comply with section 04 2000 and other requirements noted above.

2.09 SOURCE QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

B. Test samples in accordance with applicable ASTM standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and field measurements are as indicated on shop drawings.

3.02 PREPARATION

A. Prepare support equipment for the erection procedure, temporary bracing, and induced loads during erection.

3.03 ERECTION

A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.

B. Align and maintain uniform horizontal and vertical joints, as erection progresses.

C. Maintain temporary bracing in place until final support is provided. Protect members from staining.

D. Do not use powder actuated fasteners for surface attachment of accessory items except as specifically approved by the Architect and specifically accepted by the precast unit manufacturer.

E. Provide temporary lateral support to prevent bowing, twisting, or warping of members.

F. Adjust differential camber between precast members to tolerance before final attachment.

G. Install bearing pads.

H. Level differential elevation of adjoining horizontal members with grout to maximum slope of 1:12.

I. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers.

J. Grout joints between members at floor locations.

K. Secure units in place. Perform welding in accordance with AWS D1.1/D1.1M.

3.04 TOLERANCES

A. Erect members level and plumb within allowable tolerances.

B. Comply with PCI MNL-135 for erection tolerances, except as specifically amended below.
   1. Plan Location from Building Grid Datum: Plus or minus 3/4 in.
   2. Top Elevation from Building Elevation Datum at Plank Ends: Plus or minus 1/2 inch.
   3. Maximum Jog in Alignment of Matching Ends: Plus or minus 1/2 inch.
   4. Exposed Joint Dimension: Plus or minus 3/8 inch.
   5. Differential Top Elevation As Erected: Plus or minus 3/8 inch.
   6. Bearing Length in Span Direction: Plus or minus 3/8 inch.
   7. Differential Bottom Elevation of Exposed Members: Plus or minus 3/16 inch.

C. When members cannot be adjusted to comply with design or tolerance criteria, cease work and advise Architect. Execute modifications as directed.

D. For all Storm Doors, Storm Shutters, Storm Louvers and Storm Windows: The Precast Manufacturer shall comply with the frame and door manufacturers tolerances and limits for the shim space above door heads and adjacent to jambs at storm shelter doors in the storm shelter perimeter. The Precast Manufacturer shall form openings to be no greater than 1/8" larger (allowing 1/16" clearance on each side) than the ordered physical dimensions of systems for storm doors, storm shutters, storm louvers and storm windows. (The Precast Manufacturer shall be permitted to order the openings to be "exactly" sized to the component dimensions or intentionally undersized.) When the physical component is onsite, the Contractor (not the Precast Manufacturer) shall hand grind the concrete openings as needed so that the component will tightly fit into the openings without having more than 3/16" gap on any side of any component. The Contractor shall order and install frames and bottom strikes for storm doors onsite, then field measure the required vertical door dimension and then order the storm doors based on these custom dimensions. .

3.05 PROTECTION

A. Protect members from damage caused by field welding or erection operations.

B. Provide non-combustible shields during welding operations.

3.06 CLEANING

A. Clean weld marks, dirt, or blemishes from surface of exposed members.

TORNADO SHELTER COMPONENTS INSTALLATION CERTIFICATION

PROJECT:_____

LOCATION:_____

ARCHITECT'S PROJECT NUMBER: _____

OWNER:_____

CONTRACTOR: _____

INSTALLER:

Name: _____

Address: _____

Telephone Number: _____

COMPONENTS OR MATERIALS INSTALLED:

_____

UPON COMPLETION OF INSTALLATION INSTALLER CERTIFIES THAT:

A. Installer obtained a current copy of the manufacturer's published installation instructions and FEMA 361/ICC 500 requirements for the specific components or materials being installed.

B. Installer reviewed and discussed manufacturer's published installation instructions and FEMA 361/ICC 500 requirements with Project Field Superintendent before start of installation.

C. Installer furnished and installed specified tornado shelter components or materials in accordance with the Contract Documents.

D. Installer installed tornado shelter components or materials in conformance with manufacturer's published installation instructions and FEMA 361/ICC 500 requirements.

EXECUTED AND DELIVERED this _____ day of _____, 20___ .

_____

(Company name)

BY: _____

(Authorized signature)

Subscribed and sworn to before me this _____day of _____, 20___.

_____

Notary Public

_____

My Commission expires: Affix Seal

END OF SECTION

SECTION 04 0100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Final cleaning of masonry surfaces.

B. Replacement of masonry units.

C. Repointing mortar joints.

D. Repair of damaged masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Masonry Mortaring and Grouting.

B. Section 04 2000 - Unit Masonry: Brick and Block masonry units.

C. Section 04 4313 - Stone Masonry Veneer.

D. Section 04 7200 - Cast Stone Masonry.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Require attendance of parties directly affecting work of this section.
   2. Review conditions of installation, installation procedures, and coordination with related work.

1.05 SUBMITTALS

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

B. Product Data: Provide data on cleaning compounds and cleaning solutions.
   1. Cleaning Plan: Written description of cleaning process, including materials, methods, equipment, and sequencing of work.

C. Applicator Qualifications: Submit qualifications of applicator.
   1. Certification stating applicator is experienced in the application of the specified products.
   2. List of recently completed masonry cleaning projects, including project name and location, names of owner and architect, description of cleaning products used and substrates, applicable local environmental regulations, and application procedures.

D. Environmental Regulations: Submit description for testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes and cleaning effluents. Describe any hazardous materials to be cleaned from substrates. Submit applicable local environmental regulations.

E. Protection: Submit description for protecting surrounding areas, landscaping, building occupants, pedestrians, vehicles, and non-masonry surfaces during the work from contact with masonry cleaners, residues, rinse water, fumes, wastes, and cleaning effluents.

F. Surface Preparation: Submit description for surface preparation of substrates to be completed before application of masonry cleaners.

G. Application: Submit description for application procedures of masonry cleaners.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Manufacturer Qualifications:

1. Manufacturer capable of providing field service representation during installation and who will approve the installer and application method.

C. Installer Qualifications:
1. Installer experienced in performing this type of work and who has specialized in work similar to the type required for this project.

D. Pre-installation Meetings
1. Comply with provisions of Section 01 3000 - Administrative Requirements.
a. Applicator and Product representative shall be present during meeting.

1.07 MOCK-UP

A. Test Panels:
1. Before full-scale application, test products to be used on test panels.
2. Review manufacturer's product data sheets to determine suitability of each product for each surface.
3. Apply products using manufacturer-approved application methods, determining actual requirements for application.
4. After 48 hours, review effectiveness of cleaning or treatment, compatibility with substrates, and ability to achieve desired results.
5. Obtain approval by Architect and Owner of workmanship, color, and texture before proceeding with work.
6. Test Panels: Inconspicuous sections of actual construction.
a. Location and number as selected by Architect.
b. Size; 4 feet by 4 feet.
c. Repair unacceptable work to the satisfaction of the Architect and Owner.

B. Acceptable panel and procedures employed will become the standard for work of this section.

C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

B. Store cleaning materials in manufacturer's packaging.

1.09 FIELD CONDITIONS

A. Do not apply products under conditions outside manufacturer's requirements, which include:
1. Surfaces that are frozen; allow complete thawing prior to installation.
2. Surface and air temperatures below 40 degrees F.
3. Surface and air temperatures above 95 degrees F.
4. When surface or air temperature is not expected to remain above 40 degrees F for at least 8 hours after application.
5. Wind conditions that may blow materials onto surfaces not intended to be treated.
6. Less than 24 hours after a rain or 6 hours before rain is expected after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 CLEANING MATERIALS

A. Water: Clean, potable, and free of oils, acids, alkalis, salts, and organic matter. Use to rinse masonry surfaces and dilute concentrated cleaners.

B. Cleaning Agent: Product types listed are manufactured by Prosoco, inc. as basis of design.

MATERIAL	COLOR/TEXTURE	CLEANER
Brick	Red	600 Detergent

	Light	Vana Trol
	Dark	Vana Trol
	Pavers	600 Detergent
	Glazed	Vana Trol
CMU	Split Face	Custom Masonry Cleaner
	Burnished/Ground Face	Light Duty Concrete Cleaner
Cast Stone	Integral Color	Light Duty Concrete Cleaner
Architectural Concrete	Natural Color	Light Duty Concrete Cleaner
	Textured	Heavy Duty Concrete Cleaner

2.03 MORTAR MATERIALS

A. Comply with requirements of Section 04 0511.

2.04 MASONRY MATERIALS

A. Unit Masonry: Section 04 2000.

B. Cast Stone Masonry: Section 04 7200

C. Stone Veneer: Section 04 4313.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to be cleaned and restored are ready for work of this section.

B. Do not begin until test panels have been approved by Architect.

3.02 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Cover existing landscaping with tarpaulins or similar covers.

E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

F. Close off adjacent occupied areas with dust proof and weatherproof partitions.

G. Protect roof membrane and flashings from damage with 1/2 inch plywood laid on roof surfaces over full extent of work area .

H. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

I. Do not allow cleaning runoff to drain into sanitary or storm sewers.

3.03 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Support structure as necessary in advance of cutting out units.

C. Cut away loose or unsound adjoining masonry and mortar to provide firm and solid bearing for new work.

D. Build in new units following procedures for new work specified in other section(s).

E. Mortar Mix: Colored and proportioned to match existing work.

F. Ensure that anchors, ties, reinforcing, and flashings are correctly located and built in.

G. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.04 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.

C. Use power tools only after test cuts determine no damage to masonry units will result.

D. Do not damage masonry units.

E. When cutting is complete, remove dust and loose material by brushing.

F. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.

G. Moist cure for 72 hours.

3.05 CLEANING OF MASONRY

A. Comply with provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Clean all exposed surfaces of new masonry of excess mortar, efflorescence, stains, and job dirt, using materials specified.

C. Clean from top down; prevent cleaning materials and rinse water from contacting non-cementitious materials.

D. Clean in accordance with manufacturer's instructions and recommendations, product data, and container label instructions.

E. Mix materials in strict accordance with manufacturer's instructions; do not dilute unless permitted by manufacturer.

F. Prevent overspray, wind drift, and splash onto surfaces not to be treated.

G. No high pressure washers are allowed.

H. Low pressure spray for wetting and rinsing is permitted. Pressure should be in the range of 400-700 psi. Equipment should produce 4-6 gallons of water per minute using a 15-40 degree fan tip (no fan tip less than a 15-degree is allowed).

3.06 AGING

A. Rub in new masonry work to match, as close as possible, adjacent original work.
   1. Use carbon black in small amounts, rubbing in well with burlap rags.

B. After each application, dust off surplus and wash down with low pressure hose. Allow surface to dry before proceeding with succeeding applications.

C. Continue process until acceptance.

3.07 FIELD QUALITY CONTROL

A. Inspection:
   1. Inspect the masonry cleaning work with the Contractor, Architect, applicator, and product representative, and compare with test panel results approved by the Architect. Determine if the substrates are suitably clean.

B. Manufacturers' Field Services

1. Provide the services of the manufacturer's authorized field representative to verify that installed products comply with manufacturer's requirements and with the standard established by the Architect-approved test panels.

3.08 CLEANING

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Clean surrounding surfaces.

D. Repair, restore, or replace to the satisfaction of the Architect, all materials, landscaping, and non-masonry surfaces damaged by exposure to the cleaning process.

END OF SECTION

SECTION 04 0511
MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 0100 - Maintenance of Masonry: Bedding and pointing mortar for masonry restoration work.

B. Section 04 2000 - Unit Masonry: Installation of mortar and grout.

C. Section 04 4313 - Stone Masonry Veneer: Installation of mortar.

D. Section 04 7200 - Cast Stone Masonry: Installation of mortar.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

B. ASTM C5 - Standard Specification for Quicklime for Structural Purposes; 2010.

C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2021.

E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2017.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

I. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar; 2015.

J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2019.

L. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2017.

M. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

N. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2016.

1.04 SUBMITTALS

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

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used.

1. Where a water repellent admixture is specified, submit documentation showing that water repellent admixture is compatible with the water repellent used by the masonry brick/block manufacturer.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

D. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.

E. Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C476and test and evaluation reports to requirements of ASTM C1019 and ASTM C939.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions, if packaged dry mortars are used.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
   1. Maintain one copy of each document on project site.

1.06 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 4000 - Quality Requirements.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.
   1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
   1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.08 FIELD CONDITIONS

A. Temperature and Humidity
   1. During cold weather construction do not lay masonry units unless the temperature is 40 degrees Fahrenheit and rising.
   2. During hot weather construction (ambient air temperature exceeds 100 degrees Fahrenheit or 90 degrees Fahrenheit with wind velocity greater than 8 mph) do not spread mortar beds more than 4 feet ahead of masonry and set brick masonry within 1 minute of spreading mortar. Fog spray cure twice daily at four hour intervals for three days during hot weather.
   3. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperature of greater than 99 degrees Fahrenheit in the shade, with relative humidity less than 50 percent.
   4. During hot weather protect brick masonry units from sun until units are ready to be placed in the wall.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials or made from factory premixed dry materials with addition of water only.

B. Mortar Color: Natural gray unless otherwise indicated in Section 01 6210 - Schedule of Materials and Colors.
   1. Where colored mortar is specified it is recommended that factory premixed mortar be used. Mortar color shall be consistent throughout the project with the sample produced and approved on the mock-up wall.

C. Mortar Mix Designs: ASTM C270, Proportion Specification.

1. Masonry below grade and in contact with earth: Type S.
2. Exterior Masonry Veneer: Type N.
3. Exterior, Loadbearing Masonry: Type N.
4. Exterior, Non-loadbearing Masonry: Type N.
5. Exterior Repointing Mortar: Type N with maximum 2 percent ammonium stearate or calcium stearate per cement weight.
6. Interior, Loadbearing Masonry: Type N.
7. Interior, Non-loadbearing Masonry: Type N.
8. Pointing Mortar for Prefaced or Specially Faced Unit Masonry: One part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristearate, calcium stearate, or ammonium stearate equal to 2 percent of Portland cement by weight.
9. Glass Unit Masonry: Type N mortar and Type O pointing mortar.

D. Grout Mix Designs:
1. Refer to Contract Documents for grout strength and slump requirements. Provide premixed or job mixed grout in acordance with ASTM C94/C94M. It is permitted to provide fine or coarse grout in accordance with the table below:

Grout Type	Maximum Grout Pour Height	Minimum Clear Width of Grout Space	Minimum Clear Grout Space Dimensions for Grouting Cells of Hollow Units
Fine	1'-0" 5'-0" 12'-0" 24'-0"	3/4" 2" 2 1/2" 3"	1 1/2" x 2" 2" x 3" 2 1/2" x 3" 3" x 3"
Coarse	1'-0" 5'-0" 12'-0" 24'-0"	1 1/2" 2" 2 1/2" 3"	1 1/2" x 3" 2 1/2" x 3" 3" x 3" 3" x 4"

2. Grout shall be poured in maximum lift heights (increment of grout height within a pour height) and maximum grout heights (total height of masonry to be poured prior to the erection of additional masonry) noted below:
   a. Grout in partially grouted walls shall be placed in pour heights equal to the bond beam spacing not to exceed 5'-4". Pour heights are permitted to be increased up to 12'-8" provided the following conditions are met:
      1) The masonry has cured for a minimum of 4 hours.
      2) Grout slump is maintained between 10 in and 11 in.
      3) No intermediate reinforced bond beams are placed between the top and the bottom of the pour height.
   b. Grout in fully grouted walls are permitted to be poured per the maximum pour heights provided in the table above. Lift heights shall not exceed 5'-4" except that it permitted to increase lift heights to 12'-8" provided the following conditions are met:
      1) The masonry has cured for a minimum of 4 hours.
      2) Grout slump is maintained between 10 in and 11 in.
   c. Grout in lintel beams shall be placed in lift heights equal to the full depth of the beam unless noted otherwise.

2.02 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C387/C387M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.

1. Color: Mineral pigments added as required to produce approved color sample.

B. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

C. Portland Cement: ASTM C150/C150M.
   1. Type: Type I - Normal; ASTM C150/C150M.
   2. Color: Color as required to produce approved color sample.

D. Masonry Cement: ASTM C91/C91M.
   1. Type: Type N; ASTM C91/C91M.

E. Hydrated Lime: ASTM C207, Type S.

F. Quicklime: ASTM C5, non-hydraulic type.

G. Mortar Aggregate: ASTM C144.

H. Grout Aggregate: ASTM C404.

I. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Pigment:
      a. Face Brick: Natural Gray unless otherwise noted.
      b. Brick Pool Coping: Match Brick
      c. Architectural CMU: Match Unit
      d. Cast Stone/CSMU: Match Unit
      e. Existing Construction: Match existing mortar color.
   2. Manufacturers:
      a. Quikrete Companies: www.quikrete.com
      b. Amerimix, an Oldcastle brand, Bonsal American: www.amerimix.com
      c. TXI: www.txi.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

J. Water: Clean and free from deleterious acids, alkalies, and organic matter.

K. Integral Water Repellent Admixture: Polymeric liquid or powder admixture added to mortar at the time of manufacture.
   1. Performance of Mortar with Integral Water Repellent:
   2. Required only at all single wythe exterior masonry wall applications and in conjunction with hollow brick used on the back of parapet walls.
   3. At single wythe exterior concrete masonry, water repellent admixture shall be compatible with the water repellent used by the masonry unit manufacturer.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

D. No Admixtures are allowed except water repellents where required.

E. Do not use anti-freeze compounds to lower the freezing point of mortar.

F. If water is lost by evaporation, re-temper only within two hours of mixing.

2.04 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. No Admixtures are allowed except water repellents where required.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Plug clean-out holes for grouted masonry with matching masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Contractor shall note that the dimensions shown on the floor plans and plan details are in some instances nominal masonry dimensions. The contractor is responsible for coordinating the masonry layout to provide 3/8” joints. If conflict occurs, contractor shall contact Architect prior to installing masonry.

B. Site Verification of Conditions
   1. Examine the area and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
   2. Verify that wall ties, and reinforcement are properly located.
   3. Verify that flashings are properly located and intact.

C. Mortar and Grout
   1. Head joints: Regardless of thickness, completely fill with mortar or grout. Do not slush full.
   2. Except at the finishing course, stop grout approximately 1" below the top of the last course.
   3. At the finishing course, bring the last grout pour flush with the top of the brick.
   4. Whenever possible, grout from the inside face of the masonry.
   5. Take extreme care to prevent grout or mortar staining the face of masonry to be left exposed or unpainted.
   6. Protect sills, ledges, offsets, door jambs, corners, and similar points from damage and from collecting mortar or grout.
   7. Immediately remove mortar and grout from areas where they are not scheduled to be placed.
   8. All mortar shall be hard and durable after curing. Scratchable mortar is not acceptable.
   9. Perform grouting in strict accordance with the provisions of the Building Code.
   10. Solidly fill vertical cells containing reinforcement.
   11. Consolidate grout at time of pour by puddling with a mechanical vibrator, filling all cells of the masonry, and then reconsolidating later by puddling before the plasticity is lost.

D. Install mortar and grout to requirements of section(s) in which masonry is specified.

E. Work grout into masonry cores and cavities to eliminate voids.

F. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

G. Do not displace reinforcement while placing grout.

H. Remove excess mortar from grout spaces.

3.03 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Standard Concrete Masonry Units.
B. Clay facing brick.
C. Reinforcement and anchorage.
D. Flashings.
E. Lintels.
F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.
B. Section 04 0100 - Maintenance of Masonry.
C. Section 04 0511 - Masonry Mortaring and Grouting.
D. Section 05 5000 - Metal Fabrications: fabricated steel items.
E. Section 06 1000 - Rough Carpentry: Nailing strips built into masonry.
F. Section 07 2100 - Thermal Insulation: Insulation for cavity spaces.
G. Section 07 2500 - Weather Barriers: Water-resistive barriers or air barriers applied to the exterior face of the backing sheathing or masonry.
H. Section 07 6200 - Sheet Metal Flashing and Trim: Metal through-wall masonry flashings.
I. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.
J. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
B. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.
C. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
D. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
E. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.
F. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
G. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.
H. NCMA TEK 19-7 - Characteristics of Concrete Masonry Units with Integral Water Repellent, 2008
I. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meetings
   1. Comply with provisions of Section 01 3000 - Administrative Requirements.

2. Not less than one week prior to commencing all masonry related items a pre-installation conference shall be held at the site. Attendance is mandatory for all trades affected by this section. The general contractor shall be responsible for coordinating this conference with all affected trades (Including but not limited to jobsite superintendent, masonry contractor, masonry foreman, waterproofing and flashing contractor, concrete block insulator and architect). The architect will conduct the business of this meeting. All masonry work that takes place prior to this conference shall be marked as rejected and shall be removed, no exceptions.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, 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, masonry reinforcement, size and type of fasteners, and accessories for brick/blockwork support system.

D. Samples: Submit four samples of Architectural Masonry Units to illustrate color, texture, and extremes of color range.

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

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
   1. Maintain one copy of each document on project site.

B. At all units (concrete masonry, stone, cast stone or other) for which an integral water repellent was specified to be in the units, perform the Water Droplet Test as recommended in the performance criteria of NCMA TEK 19-7 associated with the Water Droplet Test Method.

C. Certifications
   1. Do not commence placement of masonry until mortar mix designs have been reviewed and approved by the Testing Laboratory and all governmental agencies having jurisdiction and until copies are at the job site.

1.07 MOCK-UP

A. Field Sample (Panels for texture and color approvals only)
   1. In an area on the site where approved by the Architect, provide sample masonry panels.
      a. Make each sample panel approximately 4'-0" high and 6'-0" long.
      b. Provide one sample panel for each combination of masonry units, bond pattern, mortar color, and joint type used in the Work.
      c. For renovation projects, locate panel adjacent to existing building to allow side by side viewing of both existing building and panel. Panel shall be located in an area that receives both direct sun and shade.
      d. Revise as necessary to secure approval from Owner and Architect.
      e. Completely demolish and remove from the job site upon completion and acceptance of the work.

B. Mock-Ups (Wall for quality control purposes)
   1. A mock-up wall shall be constructed only after the pre-installation conference.
   2. The Architect shall select a section of exterior wall within the building that shall be used for a wall mock-up to determine quality of workmanship for the entire project. The mock-up shall consist of approximately 50 lineal feet of exterior wall and shall include straight wall, corners, control and expansion joints, window installation, anchors and reinforcing, and flashings. This mock-up shall incorporate all aspects of the accepted masonry sample panel as well including proper cleaning techniques. Cleaning agent manufacturer’s representative shall be on site to observe and instruct the cleaning portion.

3. Installation of all materials and products into the wall shall be in accordance with all applicable specifications as noted in the project manual and as shown on the drawings.
4. Upon completion and acceptance of the wall mock-up and quality of workmanship, the wall shall be photographically documented by the Contractor as a record. Provide one copy of photos to each the Owner, the Architect and the Contractor. The wall shall then be incorporated into the project and shall be the standard for all masonry work on the project.
5. No work shall proceed until the mock-up wall is approved.

1.08 DELIVERY, STORAGE, AND HANDLING

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

B. All masonry products stored on site shall be properly covered from the weather to prevent deterioration and moisture penetration. Broken or damaged masonry products shall be rejected. Do not double-stack pallets.

C. Storage and protection of masonry embedded flashing;
1. Comply with manufacturer's recommendations for storage and handling of each product.
2. Wall Flashing and Surface Conditioner shall be delivered in the original, unopened manufacturer’s containers with all labeling information fully visible.
3. On-Site Storage of unopened cartons shall be such that the material is kept dry and is not stored at temperatures in excess of 100 deg. F. Pallets of cartons should not be double stacked for on-site storage.
4. Surface Conditioner is non-flammable. Refer to product label before use.

D. Acceptance at Site
1. Deliver materials in manufacturer's unopened containers, fully identified with name, brand, type, and grade.
2. Materials with missing or illegible identification shall be rejected.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Manufacturers:
1. Boral Concrete Products: www.boralconcreteproducts.com
2. Oldcastle Architectural, Jewell Concrete Products: www.jewellcp.com.
3. Spectra Development Corporation: www.spectraglaze.com.
4. Texas Building Products, Inc.: www.texasbuildingproducts.com.
5. Trenwyth Industries, Inc.: www.echelonmasonry.com.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Standard Concrete Masonry Units: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
2. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
3. Use bullnose type concrete masonry units at all edges and exterior corners in "Activity Rooms" and "Gymnasiums".
4. Load Bearing/Non-Load Bearing Units: ASTM C90, lightweight.
5. Load-Bearing Units/ Non-Loadbearing Units: ASTM C90, normal weight
   a. Provide at all sound wall locations unless noted otherwise.
6. 4" wide units shall be provided as hollow cell units.

2.02 BRICK UNITS

A. Manufacturers:
1. Acme Brick Company: www.brick.com

2. Blackson Brick Company, Inc.: www.blacksonbrick.com
3. Elgin Butler Company: www.elginbutler.com.
4. Endicott Clay Products Co: www.endicott.com.
5. General Shale Brick: www.generalshale.com.
6. Meridian Brick LLC : www.meridianbrick.com/#sle.
7. Interstate Brick: www.interstatebrick.com
8. Sioux City Brick: www.siouxcitybrick.com
9. Summit Brick: www.summitbrick.com
10. Kansas Brick and Tile/Cloud Ceramics: www.kansasbrick.com
11. Substitutions: See section 01 6000 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
1. Color and texture: Refer to Section 01 6210 – Schedule of Materials and Colors.
2. Nominal size: Modular.
3. Special shapes: Provide special shapes at all intersections not equal to 90 degrees to conform to the brick selected or of the same type and finish in the brick allowance. Where solid brick are noted on the plans, provide brick of appropriate size without cores.
4. Compressive strength: As measured in accordance with ASTM C67.

2.03 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
1. Blok-Lok Limited: www.blok-lok.com/#sle.
2. Hohmann & Barnard, Inc: www.h-b.com/sle.
3. WIRE-BONDwww.wirebond.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. In addition to all other specification requirements, veneer anchors shall be designed by a professional engineer licensed in Texas, hired by the Contractor, where the horizontal distance is greater than 4 1/2 inches between the inside face of the masonry veneer (e.g. brick, concrete masonry, cast stone, etc...) and the outside face of the structural backup system (e.g. CMU, ICF, face of cold formed metal framing members, etc...).

C. Reinforcing Steel: Type specified in Section 03 2000; size as indicated on drawings; uncoated finish.

D. Wire reinforcement: Reinforced hot dip galvanized wall reinforcing in conformance with ASTM A951, for high tensile steel. hot-dipped galvanized to comply with ASTM A153, Class BMill-galvanized wire reinforcement shall not be permitted on any part of the project. 9 gage wire, deformed to develop minimum surface bond of 527 PSI when cast in ASTM Class A mortar cubes. Provide rod spacings and veneer anchor dimensions to locate rods and veneer anchors in mortar to comply with the requirements of the applicable version of the Masonry Standards Joint Committee document TMS 402, referring to the construction drawings for dimensions of wythe thicknesses and dimensions between wythes.

E. Veneer anchor wires: Reinforced hot dip galvanized wire in conformance with ASTM A951, for high tensile steel, hot-dipped galvanized to comply with ASTM A153, Class B. Mill-galvanized wire reinforcement shall not be permitted on any part of the project. 9 gage wire. Provide rod spacings and veneer anchor dimensions to locate rods and veneer anchors in mortar to comply with the requirements of the applicable version of the Masonry Standards Joint Committee document TMS 402, referring to the construction drawings for dimensions of wythe thicknesses and dimensions between wythes.

F. Horizontal Bedjoint Reinforcement in Concrete Masonry, and Masonry Veneer Anchors with Concrete Masonry Backup Systems: Install bedjoint reinforcement at 16" on center in all concrete masonry walls, excluding masonry veneer wythes unless they are laid at the same time as backup masonry. Horizontal bedjoint reinforcement, as well as deformed rebar, shall continue through all crack control joints in all concrete masonry walls (both load-bearing and non-load-bearing, both interior and exterior).
   1. Single-wythe concrete masonry walls without masonry veneer: Ladder Type, using #220 Ladder-Mesh as manufactured by Hohmann & Barnard, Inc or equal.
   2. Single-wythe concrete masonry backup with masonry veneer laid at the same time: Ladder Type, using #230 Ladder-Tri-Mesh as manufactured by Hohmann & Barnard, Inc or equal.
   3. Single-wythe concrete masonry backup with masonry veneer laid after backup wythe: Install one of the following two options:
      a. Provide bedjoint reinforcement with eyelets flush-welded, so as to avoid wire buildup of wire laminations, and adjustable double-pintle-leg anchors at 16" on center along the bedjoint reinforcement, using Adjustable Truss Lox-All Adjustable Eye-Wire with TRU-JOINT as manufactured by Hohmann & Barnard, Inc or equal, or
      b. Provide bedjoint reinforcement without eyes, as noted above for Single-wythe concrete masonry walls without masonry veneer, and in alternating bedjoints with bedjoint reinforcement so as to avoid wire buildup of wire laminations, provide Adjustable Wall Ties (Pintles and Eyes) as manufactured by Hohmann & Barnard, Inc or equal, at 16" on center each way.
   4. Multiple-wythe concrete masonry walls, excluding masonry veneer wythes: Composite Truss Type with two rods in each wythe, using #140 Truss Twin-Mesh as manufactured by Hohmann & Barnard, Inc or equal. At walls with more than two structural wythes, alternate pairs of wythes being tied together at 8" on center so that each pair of wythes is being tied together at 16" on center.
      a. To anchor masonry veneer to multiple-wythe concrete masonry backup systems: Install Adjustable Wall Ties (Pintles & Eyes) as manufactured by Hohmann & Barnard, Inc or equal at 16" on center each way.

G. Masonry Veneer Anchors with Cast-in-place Concrete Backup Systems:
   1. At concrete backup systems formed with Expanded Polystyrene Formwork (Insulating Concrete Forms): It shall NOT be permitted to permanently anchor masonry veneer by anchoring to flanges of ICF web materials embedded in the expanded polystyrene, such as plastic or light-gage metal. One of the following options shall be installed:
      a. 2-SEAL Concrete Ties with 2-SEAL Byna-Lok Wire Ties as manufactured by Hohmann & Barnard, Inc or equal embedded in the concrete with a maximum vertical spacing of 18" and a maximum horizontal spacing of 16".
      b. Adjustable sheet metal anchors customized for the ICF industry and embedded in the concrete, using TIE-KEY adjustable sheet metal anchors as manufactured by Reward Wall Systems, or equal, to be mounted temporarily on plastic flanges of ICF web material, at a maximum tributary area of 1.5 square feet (e.g.16" vertical and 12" horizontal for Reward Systems; 18" vertical and 8" horizontal for Nudura wall systems). Anchors shall be hot-dipped galvanized to comply with ASTM A153, Class B.
   2. At concrete backup systems with temporary forms that are removed, one of the following options shall be installed:
      a. Before concrete is poured, mount 22 ga hot-dip galvanized dovetail channels to receive dovetail veneer anchors, using #305 Dovetail Slot as manufactured by by Hohmann & Barnard, Inc or equal. After concrete is poured and temporary forms are removed, install 12 ga hot-dip galvanized dovetail anchors with vee wall ties at 16" on center each way, using #315 Flexible Dovetail Brick Tie as manufactured by Hohmann & Barnard, In., or equal.

b. If dovetail channels are not installed as noted above, the Contractor shall be permitted to install a two-piece concrete anchored adjustable wire tie system at 16" on center each way, using 2-SEAL Concrete Ties with 2-SEAL Byna-Lok Wire Ties as manufactured by Hohmann & Barnard, Inc. or equal with concrete screws as recommended by the manufacturer.
   1) For precast concrete systems at storm shelters:
      (a) Anchors shall have 1 1/2" maximum penetration into concrete
      (b) Wall reinforcement shall be located with nondestructive methods (e.g. ferroscanning equipment)
      (c) Drilling for anchors shall be done with masonry drill bit incapable of penetrating steel reinforcing.
      (d) For spalls or any other damage to the precast concrete, walls shall be repaired as required by Precast Concrete Engineer.

H. Masonry Veneer Anchors with Stud Backup Systems: Install a two piece anchored adjustable wire tie system at 16" on center each way, with screws as recommended by the manufacturer and as required by the applicable version of TMS 402.
   1. Exterior stud walls with masonry veneer:
      a. Thermal 2-Seal Wall Ties as manufactured by Hohmann & Barnard, Inc.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Interior stud walls with masonry veneer:
      a. DW-10 Wall Ties as manufactured by Hohmann & Barnard, Inc.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 FLASHINGS

A. Metal Flashing Materials: Products as specified in Section 07 6200.

B. Rubberized Asphalt Flashing: Provide 40 mil. Flexible rubberized asphalt, self-sealing through-wall flashing with silicone release sheet, wall flashing accessories, flashing at spandrels and cavities; under copings, band courses, and sills; over lintels and shelf angles, flashings at low roof to high wall conditions and all other wall conditions necessary to provide a watertight wall assembly and as specified in Section 07 2500 - Weather Barriers.
   1. Manufacturers:
      a. See Section 07 2500 - Weather Barriers for manufacturers thru-wall, transition membrane required as part of the complete weather barrier assembly.
   2. Wall Flashing Accessories
      a. Provide manufacturers surface conditioner and primer.
      b. Termination Mastic:
         1) Description: Rubberized asphalt-based mastic with 200 g/l max. VOC Content.
      c. Provide aluminum termination bar equal to Hohmann & Barnard model T2-FTS.
      d. Provide three dimensional preformed external corners and end dams.

2.06 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Blok-Lok Limited: www.blok-lok.com.
      b. Hohmann & Barnard, Inc: www.h-b.com/sle.
      c. WIRE-BOND: www.wirebond.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Joint Filler: Closed cell polyethylene; oversized 50 percent to joint width; self expanding; 1/2 inch wide by maximum lengths available.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc: www.h-b.com/sle.

b. WIRE-BOND: www.wirebond.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

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 flashing locations.
a. Manufacturers:
1) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
2) Substitutions: See Section 01 6000 - Product Requirements.

D. Nailing Strips: Softwood lumber, preservative treated; as specified in Section 06 1000.

E. Weeps:
1. Type: Molded PVC grilles, insect resistant.

F. Cavity Vents:
1. Type: Molded PVC grilles, insect resistant.

G. Bond Break Material - Provide one layer of 6 mil polyethylene equal to “Visqueen Vapour Barrier” as a bond breaker between all clay masonry and CMU in the same wythe. Rake joint back 3/8” and provide continuous sealant at joint.

2.07 LINTELS

A. All concrete masonry lintels, not including 4" nominal concrete masonry veneer lintels, shall be reinforced concrete masonry lintels as specified on the Structural Drawing Sheets unless steel beam supports are shown on the Structural Drawings. Where steel beam supports are shown, the concrete masonry shall be bonded to the top of the steel beam with 1/2" diameter Nelson D2Lbars x 24" long at 16" on center.

B. All exterior masonry veneer supports over openings shall be non-galvanized steel angles bolted to the backup systems as shown on the Structural Drawings.

C. For interior masonry veneers with an air space between the veneer and backup, Interior masonry veneer supports over openings shall be the same as for exterior veneer supports, as shown on the Structural Drawings.

D. For interior masonry veneer with a mortar-filled collar joint shown on the Drawings, interior masonry veneer supports shall be loose steel lintels as scheduled on the Structural Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall note that the dimensions shown on the floor plans and plan details are nominal masonry dimensions. The contractor is responsible for coordinating the masonry layout to provide 3/8” joints. If conflict occurs, contractor shall contact Architect prior to installing masonry.

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

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

D. 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.

C. Surface Preparation for Masonry Units
1. Do not commence installation until foundations are clean, rough, and level.
2. Remove all laitance and foreign material from top of foundation.

3. Verify that the foundation elevation is such that the bed joint thickness will be between 3/8" and 1/2", and that the foundation edge is true to line.
4. Clean projecting dowels free from loose scale, dirt, concrete, and other material that will inhibit bond.
5. Verify that dowels are in proper location.

D. Surface Preparation for Rubberized Asphalt Flashing
1. Apply primer by brush or heavy nap, natural-material roller at rate recommended by manufacturer prior to flashing installation. Allow primer to dry completely before flashing application.

E. Collection System and Weeps
1. Clean flashing and weep holes so they are free of mortar droppings and debris immediately prior to installing collection system or weep.
2. Remove projecting mortar and other protrusions from substrate.
3. Remove mortar and debris from cavity spaces, wall ties, and reinforcing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. During cold weather construction do not lay masonry units unless the temperature is 40 degrees Fahrenheit and rising.

C. During hot weather construction (ambient air temperature exceeds 100 degrees Fahrenheit or 90 degrees Fahrenheit with wind velocity greater than 8 mph) do not spread mortar beds more than 4 feet ahead of masonry and set brick masonry within 1 minute of spreading mortar. Fog spray cure twice daily at four hour intervals for three days during hot weather.

D. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperature of greater than 99 degrees Fahrenheit in the shade, with relative humidity less than 50 percent.

E. During hot weather protect brick masonry units from sun until units are ready to be placed in the wall.

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. Bed joints in masonry units shall course out with bed joints in adjacent masonry wythes at vertical intervals of 16”.

D. Cut out and repoint defective joints.

E. On all joints exposed to the weather, tool and make smooth, solid, and watertight.

F. All joints shall be thumbprint hard prior to tooling.

G. Use 18” sled on bed joints, brush wall, and retool joints.

H. Concrete Masonry Units:
1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave at conditions exposed to view. Strike joints flush where a fluid applied weather barrier will be installed as specified in Section 07 2500 - Weather Barriers.
4. Align vertical cells of hollow units to maintain a clear and unobstructed system of flues.

I. Brick Units:
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. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners, except for units laid in stack bond.

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

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

I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

L. Brick and CMU wythes shall be laid in a true and straight alignment. Exterior masonry shall be laid-up separately.

M. Unless otherwise indicated on the Drawings, install masonry plumb, level, and true to line, with square angles and corners. Do not commence installation of the work until horizontal and vertical alignment of the foundation is within 1” plumb and the lines shown on the Drawings.

N. Use line blocks whenever possible. When it is absolutely necessary to use a line pin, fill the hole immediately after the pin is withdrawn.

O. Use only masonry that are clean and free from dust and other foreign matter and lay only dry masonry units.

P. Do not use bonding headers on grouted masonry unless specifically so directed by the Architect.

Q. Masonry with cracks and or chipped faces will be rejected if non-compliant with the limits noted in ASTM C216. If such units are discovered in the finished wall, the Contractor shall remove the units and replace with new units at no cost to the Owner.

R. Lay only dry concrete masonry units.

S. Accurately fit the units to plumbing, ducts, openings, and other interfaces, neatly patching all holes.

T. Keep the walls continually clean, preventing grout and mortar stains. If grout does run over, clean immediately.

U. Bed joints: A complete mortar-to-unit bond is required on all masonry.
   1. Avoid fins of bed joints protruding into grout space or cavity.
      a. If they occur, leave in place if not projecting more than the bed joint thickness.
      b. Do not, in any case, cut off and drop into the grout space or cavity.

V. Head joints: Regardless of thickness, completely fill with mortar or grout. Do not slush full.

W. Lay both Wythes of the wall to a line.

X. Provide reinforcement as shown on the drawings, fully embedded in grout and not in mortar or mortar joints. Provide required metal accessories to insure adequate alignment of steel during grout filling operations.

Y. At locations where items are mounted on/against split face CMU (i.e. door/window jambs, fire extinguisher cabinets, electric water coolers, etc.), grind split face CMU to allow flush, level installation.

3.06 WEEPS/CAVITY VENTS

A. Place weep vents in head joints at exterior wythe of cavity wall located immediately above all flashings, ledges, heads of lintels, sills, and low roof to high wall conditions spaced 24 inches on center for clay masonry units and 32 inches on center for concrete masonry units, unless otherwise shown. Leave the side of the masonry units clear from mortar (unbuttered) forming the vent space. Place the vent material into joint, directly on top of flashing material, prior to installing the second masonry unit. Install the weep vents as the wall is being erected so joints do not become filled with mortar or debris. Install a minimum of two weeps above each exterior door/window.

B. Install cavity vents in veneer and cavity walls at 24 or 32 inches on center horizontally near top of walls.

3.07 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 1 continuous row at base of wall and over all wall openings directly on flashing. To prevent mortar bridging between the outer wythe and inner wall, install flashing extending from the bottom of the collection system to at least 6" above the top of the collection system.

D. Install with the offset edge pointing up the wall.

E. Lay the first 1 or 2 courses of masonry at flashing level, then install the collection system continuously by placing it against the inside of the openings. No fasteners or adhesives are required.

F. Compress the collection system horizontally so it can be forced into cavities slightly smaller than its nominal thickness without affecting performance. When forcing the collection system into a cavity, be sure mortar has set sufficiently to resist outward pressure from product.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

A. Refer to the Structural and Architectural Drawings for reinforcement required in masonry.

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

C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

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

E. Lap joint reinforcement ends minimum 6 inches.

F. 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 16 inches horizontally and 16 inches vertically.

G. Underlay Insulation Masonry Tie Installation:

1. Bracket legs shall firmly engage steel stud flange. Place bracket over a steel stud framing member and impale into insulation. Secure bracket to steel stud in accordance with manufacturer's instructions.

2. Insert tie into slotted portion of masonry tie bracket. Adjust vertically to fit masonry coursing.

H. Do not use reinforcement having any of the following defects.
1. Bar lengths, depths, or bends exceeding the specified tolerances.
2. Bends or kinks not indicated on the Drawings or required for the Work.
3. Bars with cross-section reduced due to excessive rust or other causes.

3.09 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. Install flashing to dry surfaces when air and surface temperatures are 25ºF and above.
2. All flashings shall be installed to produce a fully watertight assembly.
3. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
4. Do not expose flashing membrane to sunlight for more than thirty days prior to enclosure.
5. Prepare the masonry surfaces so that they are smooth and free of obstructions where installing flashings. Apply the surface conditioner per the manufacturers written recommendations for proper adhesion of the flashings.
6. Precut pieces of flashing to easily handled lengths for each location.
7. Remove release paper and position flashing carefully before placing it against the surface.
8. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
9. Overlap adjacent pieces 6” and roll all seams with a steel hand roller.
10. Install prefabricated external and internal corners and end dams.
11. Extend the flashing from 1/2” outside the face of the exterior wall, through the exterior masonry wythe, and extend up the cavity space a minimum of 8”. Install termination bar at top of flashing and seal with mastic.
12. Install weeps as specified keeping the joint clean of mortar to insure proper weeping action.
13. Flashing shall not be permanently exposed to sunlight.
14. At heads, sills and all flashing terminations, provide end dams, with the seams sealed. Provide compressible filler at the end of all flashings at steel lintels.
15. Apply a bead or trowel coat of mastic along flashing top edge, seams, cuts, and penetrations for a completely watertight condition.

B. Laying Masonry Walls: Provide a solid surface at flashing areas using inverted lintels, solid or filled masonry units. Flash at all breaks in wall face where cells are not grouted.

C. At wall base flashings, place the flashing below the mortar bed.

D. Provide continuous flashing at all locations where exterior wall is penetrated by a steel or concrete member.

E. At all lintels, shelf angles, door and window heads, install specified metal drip flashing on steel lintel over rosin paper. Extend flashing a minimum of 8” past the jambs of doors and windows and at other masonry openings. Install three dimensional end dams at all inside and outside corners.

F. At low roof to high wall flashing conditions install the through wall flashings as described above. Carefully coordinate the placement of the flashings and weeps with the general construction, assuring no weeps occur below the adjacent low roof flashings.

G. Through wall flashings that are improperly installed or installed in the wrong position shall be removed by the Contractor and new flashings installed to the proper condition.

H. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.10 GROUTED COMPONENTS

A. Fill one cell of CMU with grout and 1 - #5 bar vertical at each window and door jamb in CMU walls, from floor level to top of wall.

B. Fill 3 cells of CMU with grout and 1 - #5 bar vertical in each cell at all exterior corners of CMU walls, fill full height of wall and extend #5 bar into bond beam a minimum of 6” then bend 90° and extend a minimum of 6”.

C. See drawings for other areas of grout fill required in CMU.

D. Where the collar joint is to be grouted between the wythes of masonry, provide expanded metal or mortar/grout screen at the beginning of the grout.

E. All vertical bars shall be dowelled to the foundations with same size reinforcing bar.

F. Lap splices minimum 48 bar diameters.

G. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

H. Place and consolidate grout fill without displacing reinforcing.

I. At bearing locations, fill masonry cores with grout for a minimum 8 inches either side of opening.

3.11 CONTROL AND EXPANSION JOINTS

A. Locate 3/8” wide expansion and control joints as indicated on the drawings. However in no case shall they exceed 20’-0” in distance. Contractor shall ensure that joints occur at intervals no more than as noted above and notify the Architect for coordination of placement if additional joints are required. Keep vertical joints straight, true and continuous from top to bottom of masonry.
   1. Expansion joints shall be completely free of mortar and the joint reinforcement shall not continue across the expansion joint. Keep vertical joints straight, true and continuous from top to bottom of masonry. Detail joint as shown on the drawings
   2. At control joints horizontal reinforcing shall run continuous through joint. Detail joint as shown on the drawings.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Form expansion joint as detailed on drawings.

3.12 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed 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 8 inches from framed openings.

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

3.13 TOLERANCES

A. Maximum Variation from Alignment of Columns: 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 Joint Thickness: 1/8 inch in 3 ft.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. 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 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

3.16 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.

3.17 PROTECTION

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

B. The masonry walls shall be covered at the end of each workday and when work is not in progress. The walls shall be covered with heavy plastic sheeting or water repellent tarps and shall extend a minimum of 2’-0” down each side of the wall and be securely held in place.

END OF SECTION

SECTION 04 4313
STONE MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Anchored cut stone veneer at exterior walls.

B. Metal anchors and accessories for anchored veneer.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Masonry Mortaring and Grouting: Setting and pointing mortar.

B. Section 04 2000 - Unit Masonry: Joint reinforcement, Ties, Anchors, and Through-wall flashing.

C. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing or block.

D. Section 07 6200 - Sheet Metal Flashing and Trim: Flashings.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. ASTM C568/C568M - Standard Specification for Limestone Dimension Stone; 2022.

C. ILI (HB) - Indiana Limestone Handbook; 2007.

D. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Comply with provisions of Section 01 3000 - Administrative Requirements.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1. Not less than one week prior to commencing all masonry related items a pre-installation conference shall be held at the site. Attendance is mandatory for all trades affected by this section. The general contractor shall be responsible for coordinating this conference with all affected trades (Including but not limited to jobsite superintendent, masonry contractor, masonry foreman, waterproofing and flashing contractor, concrete block insulator and architect). The architect will conduct the business of this meeting. All masonry work that takes place prior to this conference shall be marked as rejected and shall be removed, no exceptions.

1.05 SUBMITTALS

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

B. Product Data: Provide data on stone units, mortar, and reinforcement.

C. Samples: Submit two stone samples illustratingminimum and maximum stone sizes, color range, texture, and markings.

D. Samples: Submit mortar color samples.

1.06 QUALITY ASSURANCE

A. Stone Fabricator Qualifications: Company specializing in fabricating cut stone with minimum five of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type required by this section, with minimum five years ofdocumented experience.

1.07 MOCK-UP

A. Field Sample (Panels for texture and color approvals only)

1. In an area on the site where approved by the Architect, provide sample masonry panels.
   a. Make each sample panel approximately 4'-0" high and 6'-0" long.

b. Provide one sample panel for each combination of masonry units, bond pattern, mortar color, and joint type used in the Work.
c. For renovation projects, locate panel adjacent to existing building to allow side by side viewing of both existing building and panel. Panel shall be located in an area that receives both direct sun and shade.
d. Revise as necessary to secure approval from Owner and Architect.
e. Completely demolish and remove from the job site upon completion and acceptance of the work.

B. Mock-Ups (Wall for quality control purposes)
1. A mock-up wall shall be constructed only after the pre-installation conference.
2. The Architect shall select a section of exterior wall within the building that shall be used for a wall mock-up to determine quality of workmanship for the entire project. The mock-up shall consist of approximately 50 lineal feet of exterior wall and shall include straight wall, corners, control and expansion joints, window installation, anchors and reinforcing, and flashings. This mock-up shall incorporate all aspects of the accepted masonry sample panel as well including proper cleaning techniques. Cleaning agent manufacturer's representative shall be on site to observe and instruct the cleaning portion.
3. Installation of all materials and products into the wall shall be in accordance with all applicable specifications as noted in the project manual and as shown on the drawings.
4. Upon completion and acceptance of the wall mock-up and quality of workmanship, the wall shall be photographically documented by the Contractor as a record. Provide one copy of photos to each the Owner, the Architect and the Contractor. The wall shall then be incorporated into the project and shall be the standard for all masonry work on the project.
5. No work shall proceed until the mock-up wall is approved.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect stone from discoloration during storage on site.

B. Provide ventilation to prevent condensation from forming on stone.

1.09 FIELD CONDITIONS

A. Cold Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stone Quarriers:
1. Oldcastle/ Custom Stone Supply
2. Blackson Brick Company, Inc.
3. Mezger
4. Continental Cut Stone Quarries
5. Superior Stone, Inc.
6. Texas Quarries
7. Texas Stone Products
8. Texas Masonry Products

B. Stone Masonry Reinforcement and Accessories - Anchored Veneer:
1. Blok-Lok Limited: www.blok-lok.com.
2. Hohmann & Barnard, Inc: www.h-b.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STONE

A. Limestone: Limestone; complying with ASTM C568/C568M Classification II - Medium Density

1. Grade: Standard, per ILI (HB).
2. Color: Reference Section 01 6210-Schedule of Materials and Colors.
3. Surface Texture: Chopped.

2.03 MORTAR APPLICATIONS

A. Mortar and Grout: As specified in Section 04 0511.

2.04 ACCESSORIES - ANCHORED VENEER

A. Horizontal Joint Reinforcement and wall ties: As specified in Section 04 2000.

B. Other Anchors in Direct Contact with Stone: ASTM A666 Type 304, stainless steel, of sizes and configurations required for support of stone and applicable superimposed loads.

C. Setting Buttons and Shims: Plastic.

D. Flashings: As specified in Section 04 2000 and 07 6200.

E. Weep/Cavity Vents: Molded PVC grille insect resistant.

F. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

2.05 STONE FABRICATION - ANCHORED VENEER

A. Nominal Thickness: 4 to 5 inch.

B. Nominal Face Size: 4 to 20 inch.

C. Pattern and Coursing: Ashlar.

D. Fabricate for 3/8 inch beds and joints.

E. Bed and Joint Surfaces:
1. Cut or sawn top and bottom for full thickness of unit.

F. Backs: Rough.

G. Form stone corners to irregular joint profile. Clean jagged corners from stone in preparation for setting.

H. Slope exposed top surfaces of stone and horizontal sill surfaces for shedding water.

I. Cut drip slot in bottom surface of work projecting more than 1/2 inch over window frame. Size slot not less than 3/8 inch wide and 1/4 inch deep for full width of projection.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that support work and site conditions are ready to receive work of this section.

B. Verify that items built-in under other sections are properly located and sized.

3.02 PREPARATION - ANCHORED VENEER

A. Establish lines, levels, and coursing. Protect from disturbance.

B. Clean stone prior to installation. Do not use wire brushes or implements that mark or damage exposed surfaces.

C. Clean sawn surfaces of rust stains and iron particles.

3.03 INSTALLATION - ANCHORED VENEER

A. Install flashings of longest practical length and seal watertight to back-up. Lap end joints minimum 6 inches and seal watertight.

B. Exclude stone with peeling, flaking or delaminating faces.

C. Size stone units to fit opening dimensions and perimeter conditions.

D. Clean stone prior to erection. Do not use wire brushes or implements that mark or damage exposed surfaces.

E. Clean sawn surfaces of rust stains and iron particles.

F. Wet absorptive stone in preparation for placement to minimize moisture suction from mortar.

G. Arrange stone pattern to provide color uniformity and minimize visual variations , and provide a uniform blend of stone unit sizes.

H. Provide setting and pointing mortar in accordance with Section 04 0511.
   1. If water is lost by evaporation, re-temper mortar only within two hours after mixing.
   2. At ambient air temperature 80 degrees F and above, use mortar within two hours after mixing; at ambient air temperature below 50 degrees F, use mortar within two-and-one-half hours after mixing.

I. Fill dowel holes in stone units with mortar.

J. Arrange stone coursing in running bond with consistent joint width.

K. Set stone in full mortar setting bed to fully support stone over bearing surface. Use setting buttons or shims to maintain correct joint width.

L. Install weep/cavity vents in vertical stone joints at 16 inches on center horizontally; immediately above horizontal flashings, above shelf angles and supports, and at top of each cavity space; do not permit mortar accumulation in cavity space.

3.04 REINFORCEMENT AND ANCHORAGE - ANCHORED VENEER

A. Install horizontal joint reinforcement 16 inches on center.

B. Place horizontal joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

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

D. Lap joint reinforcement ends minimum 6 inches.

E. Embed wall ties in masonry back-up to bond veneer to back-up at minimum of one for every 2-2/3 sq ft.

F. In addition, place wall ties at maximum 3 inches on center each way around perimeter of openings, within 12 inches of openings.

G. Reinforce joint corners and intersections with strap anchors 16 inches on center.

3.05 JOINTS - ANCHORED VENEER

A. Leave the following joints open for sealant specified in Section 07 9200:
   1. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
   2. Joints in projecting units.
   3. Joints between rigidly anchored units, including soffits, panels, and column covers.
   4. Joints below lugged sills and stair treads.
   5. Joints below ledge and relieving angles.
   6. Joints labeled "expansion joint".

B. Rake out mortar joints 5/8 to 3/4 inch and brush joints clean to accommodate pointing mortar. Fill joints with pointing mortar.

C. Pack mortar into joints and work into voids. Neatly tool surface to concave joint.

D. At joints to be sealed, clean mortar out of joint before it sets. Brush joints clean.

3.06 INSTALLATION - 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.

B. Extend metal flashings through exterior face of stone and terminate in an angled drip with hemmed edge.

C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.07 CONTROL AND EXPANSION JOINTS

A. Form joints as detailed on drawings.

3.08 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

3.09 CLEANING

A. Remove excess mortar as work progresses, and upon completion of work.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.10 PROTECTION

A. During temporary storage on site, at the end of working day, and during rainy weather, cover stone work exposed to weather with non-staining waterproof coverings, securely anchored.

END OF SECTION

SECTION 04 7200
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Masonry Mortaring and Grouting: Mortar for setting cast stone.

B. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

C. Section 04 4313 - Stone Masonry Veneer.

D. Section 07 9005 – Joint Sealers.

1.03 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

D. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.

E. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

H. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

I. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

J. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

K. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

L. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2017.

1.04 SUBMITTALS

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

B. Product Data: Test results of cast stone components made previously by the manufacturer.
   1. Include one copy of ASTM C1364 for Architect's use.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
   1. Cast stone and anchors shall be designed and stamped by a professional engineer in the State of Texas.

D. Mortar Color Selection Samples.

E. Verification Samples: Pieces of actual cast stone components not less than 12 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

F. Full-Size Samples, For Review:
   1. Basic Shapes: One of each.
   2. Accent, Trim and Specialty Shapes: One of each.

G. Source Quality Control Test Reports.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
   2. Current producer member of the Cast Stone Institute or the Architectural Precast Association.
   3. Manufacturer's production facility currently holds a Plant Certification from the Cast Stone Institute or the Architectural Precast Association.
   4. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.06 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.

1.07 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. Any current producer member of the Architectural Precast Association.
   2. Any current producer member of the Cast Stone Institute.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural stone, 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. Cast Stone Color: Reference Section 01 6210 – Schedule of Materials and Colors.
5. Color Variation:
   a. Viewing Conditions: Compare in direct daylight at 10 feet, between components of similar age, subjected to comparable weathering conditions.
   b. Maximum Variation, ASTM D 2244:
      1) Hue: 2 units.
      2) Lightness, Chroma, and Hue Combined: 6 units.
6. Cure units in a warm, moist curing chamber at 95% relative humidity in totally enclosed curing room under dense fog and water-spray for 24 hours.
7. 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. Inset Letters:
   1. Refer to plans for copy.
   2. Paint all inset letters flat black.

D. 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, white or gray as required to match Architect 's sample.
   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.
   1. All units shall contain a manufacturer approved integral water repellent admixture at the time of manufacture.

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M 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: ASTM A 123/A 123M hot-dip galvanized steel, of type and size as required for conditions.

J. Shelf Angles and Similar Structural Items: Hot-dip galvanized steel per ASTM A123/A123M, of shapes and sizes as required for conditions.

K. Mortar: Portland cement-lime, as specified in Section 04 0511 ; do not use masonry cement.

L. Sealer: Provide a weather/graffiti protectant to interior and exterior cast stone units as specified in Section 07 1900 - Water Repellents

M. 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. Surface Preparation
1. Clean substrates.
2. Wet down or wash dry, dusty surfaces and remove excess water immediately prior to application of cast stone.
3. Prepare surfaces in strict accordance with manufacturer’s instructions.
4. Scarify concrete substrates with blast track equipment if necessary to completely remove curing compounds or other substances that would interfere with proper bond of setting materials. Clean and maintain substrate in condition required by setting material manufacturer.
5. Do not seal substrate unless required by manufacturer.
6. Prime substrate when required by manufacturer.

D. Mechanically anchor cast stone units indicated; set remainder in mortar.

E. 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. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 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. 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 1200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members and support members.

B. Base plates, shear stud connectors and expansion joint plates.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 2100 - Steel Joist Framing.

B. Section 05 3100 - Steel Decking: Support framing for small openings in deck.

C. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2017.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

C. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

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; 2012.

F. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

I. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2014.

J. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2015.

K. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2007 (Reapproved 2013).

L. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).

M. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

N. 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.

O. 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.

P. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2018a.

Q. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2015, with Editorial Revision (2018).

R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

S. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

T. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2014, with Errata (2015).

U. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

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

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections and the calculations for the design of these connections.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
   5. Include the design engineer's stamp or seal on each sheet of shop drawings and on the coversheet for calculations. The engineer shall be licensed in the State of Texas.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Maintain one copy of each document on site.

C. Fabricator: Company specializing in performing the work of this section with minimum three years ofdocumented experience.

D. Erector: Company specializing in performing the work of this section with minimum three years of documented experience.

E. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Texas.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

D. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.

E. Steel Bars: ASTM A108Grade 50.

F. Steel Plate: ASTM A514/A514M.

G. Steel Sheet: ASTM A1011/A1011M, Designation SS, Grade 30 hot-rolled, or ASTM A1008/A1008M, Designation SS, Grade 30 cold-rolled.

H. Pipe: ASTM A53/A53M, Grade B, Finish black.

I. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

J. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.

K. Headed Anchor Rods: ASTM F 1554, Grade 55, plain as indicated on the drawings.

L. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

M. Sliding Bearing Plates: Teflon coated.

N. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C 1107/C 1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

O. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

P. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Space shear stud connectors at as indicated on the drawings.

C. Continuously seal joined members by intermittent welds and plastic filler. Grind exposed welds smooth.

D. Fabricate connections for bolt, nut, and washer connectors.

E. Develop required camber for members.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP 3, Power Tool Cleaning.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.04 SOURCE QUALITY CONTROL

A. If any steel fabrication occurs off-site (at a fabrication shop) that is not an AISC certified fabrication shop, the Steel Fabricator shall pay for the SITA to perform the special inspections or testing required by Section 01 4533 for all such off-site steel fabrication. Source quality control testing is not required for any steel provided by an AISC certified steel fabrication shop.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Architect.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

END OF SECTION

SECTION 05 2100
STEEL JOIST FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Open web steel joistsand shear stud connectors, with bridging, attached seats and anchors.

B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.

C. Supplementary framing for floor and roof openings greater than 18 inches.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Grouting base plates and bearing plates. Superstructure framing.

B. Section 05 1200 - Structural Steel Framing: Superstructure framing.

C. Section 05 3100 - Steel Decking: Support framing for openings less than 18 inches in decking.

D. Section 05 5000 - Metal Fabrications: Non-framing steel fabrications attached to joists.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

E. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

G. SJI 100 - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; 2011.

H. SJI (SPEC) - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; 2011.

I. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; 2008.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

K. SSPC-SP 2 - Hand Tool Cleaning; 2024.

L. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.

C. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Texas.

B. Perform Work, including that for headers and other supplementary framing, in accordance with SJI 100 Standard Specifications Load Tables and SJI Technical Digest No. 9.

C. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum three yearsdocumented experience.

D. Erector Qualifications: Company specializing in performing the work of this section with minimum three yearsdocumented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Joists:
   1. Canam Group Inc: www.canam-steeljoists.ws
   2. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
   3. New Mellennium Building Systems, LLC: www.newmill.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Open Web Joists: SJI Type K Joists:
   1. Provide bottom and top chord extensions as indicated.
   2. Minimum End Bearing on Steel Supports: As shown on the drawings.
   3. Minimum End Bearing on Concrete or Masonry Supports: As shown on drawings.
   4. Finish: Shop primed.

B. Open Web Joists: SJI 100 Type LH Joists:
   1. Provide bottom chord extensions as indicated.
   2. Minimum End Bearing on Steel Supports: Comply with referenced SJI standards.
   3. Minimum End Bearing on Masonry or Concrete Supports: Comply with referenced SJI standards.
   4. Finish: Shop primed.

C. Open Web Joists: SJI 100 Joist Girders:
   1. Provide bottom chord extensions as indicated.
   2. Minimum End Bearing on Steel Supports: Comply with referenced SJI standards.
   3. Minimum End Bearing on Masonry or Concrete Supports: Comply with referenced SJI standards.
   4. Finish: Shop primed.

D. Anchor Bolts, Nuts and Washers: ASTM A307 hot-dip galvanized per ASTM A153/A153M Class C.

E. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

F. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A 36/A 36M.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Frame special sized openings in joist web framing as detailed.

2.04 FINISH

A. Shop prime joists as specified.
   1. Do not prime surfaces that will be fireproofed, field welded, or in contact with concrete.

B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

2.05 SOURCE QUALITY CONTROL

A. For joist fabrication that occurs at a joist fabrication shop that is not an SJI certified joist fabrication shop, the Joist Fabricator shall pay for the SITA to perform the special inspections or testing required by Section 01 4533 for all such off-site steel fabrication. Source quality control testing is not required for any joists provided by an SJI certified joist fabrication shop.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 ERECTION

A. Erect joists with correct bearing on supports.

B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.

C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.

D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.

E. Position and field weld joist chord extensions and wall attachments as detailed.

F. Install supplementary framing for floor and roof openings greater than 18 inches.

G. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.

H. Do not field cut or alter structural members without approval of joist manufacturer.

I. After erection, prime welds, damaged shop primer, and surfaces not shop primed , except surfaces specified not to be primed.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

END OF SECTION

SECTION 05 3100
STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof deck.

B. Composite floor deck.

C. Metal form deck.

D. Supplementary framing for openings up to and including 18 inches.

E. Bearing plates and angles.

F. Acoustical insulation in roof deck flutes.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing.

B. Section 03 3000 - Cast-in-Place Concrete: Concrete topping over metal deck.

C. Section 05 1200 - Structural Steel Framing: Support framing for openings larger than 18 inches and shear stud connectors.

D. Section 05 5000 - Metal Fabrications: Steel angle concrete stops at deck edges.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2013.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

G. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

H. FM (AG) - FM Approval Guide; current edition.

I. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems; 2022.

J. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; 2016.

K. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

M. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

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

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.

D. Certificates: Certify that products furnished meet or exceed specified requirements.

E. Submit manufacturer's installation instructions.

F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Texas.

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:
1. Canam Steel Corporation: www.canam-steeljoists.ws.
2. CSI - Metal Dek Group: www.metaldek.com
3. Nucor-Vulcraft Group: www.vulcraft.com.
4. New Mellennium Building Systems, LLC: www.newmill.com
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STEEL DECK

A. Roof Deck:
1. Type "B": Non-composite type, fluted steel sheet
2. Steel Sheet:
   a. Ungalvanized Steel Sheet: ASTM A1008/1008M, Designation SS, Grade 33, Type 1. (typical) except where metal roof deck is to receive cementitious fireproofing.
   b. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating where metal roof deck is to receive cementitious fireproofing.
3. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
4. Structural Properties:
   a. Span Design: Triple.
5. Minimum Metal Thickness, Excluding Finish: 20 gage (unless noted otherwise on the Structural Drawings).
6. Nominal Height:
   a. Type "B": 1-1/2"
7. Profile:
   a. Type "B": Fluted; SDI WR
8. Formed Sheet Width:
   a. Type "B": 36 inch
9. Deck Attachment:
   a. Side Joints: As noted on Structural Drawings.
   b. End Joints/Fasteners and Intermediate Support Fasteners: As noted on Structural Drawings.

c. Side Support Fasteners: match spacing of end joint fastener patterns.

B. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
1. Galvanized Steel Sheet: {\rs\#1}, Structural Steel (SS) Grade 33/230, with G60/Z180 galvanized coating.
2. Minimum Base Metal Thickness: 20 gage, 0.0359 inch.
3. Nominal Height: 2 inches.
4. Profile: Fluted. Equal to 2VLI as manufactured by Vulcraft
5. Formed Sheet Width: 36 inch.
6. Side Joints: Lock seam with properly spaced button punches.
7. End Joints/Fasteners and Intermediate Support Fasteners: Lapped, welded. 5/8" diameter puddle welds on a 36/4 pattern
8. Side Support Fasteners: 5/8" diameter puddle welds at 9" on center.

C. Metal Form Deck: Corrugated sheet steel:
1. Galvanized Steel Sheet: {\rs\#1}, Structural Steel (SS) Grade 33/230, with G60/Z180 galvanized coating.
2. Minimum Metal Thickness, Excluding Finish: 20 gage unless noted otherwise on the structural drawings
3. Nominal Height: 1 inch.
4. Profile: Fluted. Equal to 1.0 C as manufactured by Vulcraft
5. Formed Sheet Width: 33 inch.
6. Side Joints: Lock seam with button punches as required by deck manufactorer for construction purposes but not greater than 36" OC.
7. End Joints: Lapped, mechanically fastened with #12 TEK screws on a 33/4 pattern.

2.03 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steelunfinished.

B. Welding Materials: AWS D1.1/D1.1M.

C. Fasteners: Galvanized hardened steel, self tapping.

D. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.
1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.
2. Material: Steel; ASTM A510/A510M.
a. Hardness: Rockwell C 54.5, minimum.
b. Tensile Strength: 285 kips per square inch, minimum.
c. Shear Strength: 175 kips per square inch, minimum.
d. Washers:
1) Steel Bar Joist Framing Applications: 0.472 inch diameter, minimum.
2) Exposed Roof Deck Applications: 0.591 inch diameter, minimum.
e. Corrosion Resistance:
1) Steel Bar Joist Framing Applications: ASTM B633, SC1, Type III zinc electroplate..
2) Exposed Roof Deck Applications: Provide manufacturer's standard stainless steel sealing caps with bonded neoprene washer over each fastener.

E. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.

2. Fasteners for Steel Roof Decks Protected with Waterproofing Membrane: ASTM B633, SC1, Type III zinc electroplate.
3. Fasteners for Exposed Steel Roof Deck Application: Manufacturer's standard stainless steel with bonded neoprene washer.

F. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.

G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

H. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

I. Acoustical Insulation: Glass fiber type, minimum 1.1 lb/cu ft density; profiled to suit deck.

2.04 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 20 gage, 0.0359 inch thick sheet steel; of profile and size as indicated; finished same as deck.

B. Cant Strips: Formed sheet steel, 20 gage, 0.0359 inch minimum thickness, 45 degree slope, 3-1/2 inch nominal width and height, flange for attachment.

C. Roof Sump Pans: Formed sheet steel, 14 gage, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

D. Floor Drain Pans: Formed sheet steel, 14 gage, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

3.03 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual. Align and level.

B. On concrete surfaces provide minimum 4 inch bearing.

C. On steel supports provide minimum 1-1/2 inch bearing.

D. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at every other transverse flute using methods indicated on drawings.
1. Welding: Use fusion welds through weld washers.
2. Place and secure special deep fluted sections for integral concrete bridging.

E. At mechanically fastened male/female side laps fasten as indicated in section 2.02.

F. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

G. At welded male/female side laps weld at 18 inches on center maximum.

H. Weld deck in accordance with AWS D1.3/D1.3M.

I. At deck openings greater than 8 inches, provide support per Structural Drawings. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.

J. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.

K. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.

L. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

M. Close openings above walls and partitions perpendicular to deck flutes with double row of foam cell closures.

N. Place metal cant strips in position and mechanically attach.

O. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

P. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

Q. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing, both load-bearing and non-load-bearing, including soffit framing and other non-structural miscellaneous framing.

B. Formed steel joist and purlin framing and bridging.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing.

B. Section 05 3100 - Steel Decking.

C. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS

A. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

B. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

C. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Indicate stud, floor joist, ceiling joist, roof rafter, and roof truss layout.
   2. Describe method for securing studs and all of the cold formed metal framing to tracks and any other boundary supports all framing connections.
   3. Design data:
      a. Shop drawings signed and sealed by a professional structural engineer.

D. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Texas.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.07 MOCK-UP

A. Provide mock-up of exterior framed wall, including components specified elsewhere, such as insulation, sheathing, window frame, door frame, exterior wall finish, and interior wall finish.

B. Mock-Up Size: 4 by 4 feet, including corner condition.

C. Location: As directed.

D. Mock-up may not remain as part of the Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
   1. CEMCO: www.cemcosteel.com.
   2. ClarkDietrich Building Systems: www.clarkdietrich.com.
   3. Mill Steel Company: www.millsteelframing.com
   4. Telling Industries, LLC: www.buildstrong.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.
   2. Simpson Strong Tie: www.strongtie.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, straight and curved track, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: As indicated on the drawings.
   4. Wind and Live load deflection meeting the following, unless otherwise indicated:
      a. Floors: Maximum vertical deflection under live load of 1/360 of span.
      b. Roofs: Maximum vertical deflection under live load of 1/180 over areas without a ceiling, 1/240 over areas with a nonplaster ceiling and 1/360 over areas with a plaster ceiling.
      c. Interior Walls that have no exposure to exterior wind pressures: Maximum horizontal deflection under interior wind pressures of 1/360 of span.
      d. Exterior Walls: Maximum horizontal deflection under service level Components and Cladding wind load of 1/600 of span where masonry veneer or plaster is outside of the stud wall and 1/360 of span where metal panel or flexible finishes are outside of the stud wall.

5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

C. Shop fabricate framing system to the greatest extent possible.

D. Deliver to site in largest practical sections.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
1. Gage and depth: Minimum 18 gage thickness for exterior walls, and depth as shown on the drawings. Minimum 25 gage thickness for interior walls, and depth as shown on the drawings. The Cold Formed Metal Framing Engineer may increase the gage and decrease the spacing as required for design but may not increase the depth as shown on the drawings.
2. Galvanized in accordance with ASTM A653/A653M, G60/Z180 coating.
3. Provide components fabricated from ASTM A 1008/A 1008M, Designation SS steel.

B. Joists and Purlins: Fabricated from ASTM A653/A653M steel sheet, with G60/Z180 hot dipped galvanized coating.
1. Base Metal: Structural Steel (SS), Grade 33/230.
2. Gage and depth: Minimum 18 gage thick, and depth as shown on the drawings. The Cold Formed Metal Framing Engineer may increase the gage and decrease the spacing as required for design but may not increase the depth as shown on the drawings.

C. Framing Connectors: Factory-made, formed steel sheet.
1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch, and factory punched holes and slots.
2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections at the following locations:
   a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
   b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
   c. Provide top track with long leg track and head of wall movement connectors; minimum track length of 12 feet.
4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated, Drilled expansion bolts, and Screws with sleeves.

C. Welding: Comply with AWS D1.1/D1.1M.

2.05 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing components are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with ASTM C1007 requirements and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below openings to align with wall stud spacing.

I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

J. Attach cross studs to studs for attachment of fixtures anchored to walls.

K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

L. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 INSTALLATION OF JOISTS AND PURLINS

A. Install framing components in accordance with manufacturer's instructions.

B. Make provisions for erection stresses. Provide temporary alignment and bracing.

C. Place joists at 16 inches on center; not more than 2 inches from abutting walls. Connect joists to supports using fastener method.

D. Set floor and ceiling joists parallel and level, with lateral bracing and bridging.

E. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.

F. Provide web stiffeners at reaction points.

G. Touch-up field welds and damaged galvanized surfaces with primer.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/4 inch.

B. Maximum Variation of any Member from Plane: 1/4 inch.

END OF SECTION

SECTION 05 4400
COLD-FORMED METAL TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Light gage cold-formed steel roof trusses.

B. Anchorages, bracing, and bridging.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Light gage structural metal studs, joists, and rafters.

B. Section 06 1000 - Rough Carpentry:

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

D. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

F. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

G. CFSEI 5000 - Field Installation Guide for Cold-Formed Steel Roof Trusses; May 2000.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Meet at project site prior to beginning of installation to review requirements. Require attendance by representatives of the following:
   1. Truss fabricator.
   2. Truss installer.
   3. Other entities affected by the work of this section, including but not limited to truss support framing installer, mechanical systems installer, and electrical systems installer.

1.05 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. Span charts.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings:
   1. Include detailed roof truss layout.
   2. Show member type, location, spacing, size and gage, methods of attachment, and erection details. Indicate supplemental bracing, strapping, splices, bridging, and accessories.
   3. Include truss design drawings, signed and sealed by a qualified professional engineer registered in Texas, verifying ability of each truss design to meet applicable code and design requirements.
      a. Include the following:
         1) Design criteria.

2) Engineering analysis depicting member stresses and deflections.
3) Member sizes and gages.
4) Details of connections at truss joints.
5) Truss support reactions.
6) Bracing requirements.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design trusses under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Texas.

B. Fabricator Qualifications: Steel truss fabricator with minimum 5 years of experience designing and fabricating truss systems equivalent to those required for this project and licensed by an acceptable manufacturer.

C. Installer Qualifications: Experienced installer approved by truss system fabricator.

D. Welders: Qualify welding processes and welding operators in accordance with AWS B2.1/B2.1M.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver trusses and other materials in manufacturer's unopened bundles or containers, each marked with manufacturer's name, brand, type, and grade. Exercise care to avoid damage during unloading, storing, and erection.

B. Store trusses on blocking, pallets, platforms, or other supports, off the ground and in an upright position, sufficiently braced to avoid damage from excessive bending. Gently slope stored trusses to avoid accumulation of water on interior of truss chord members.

C. Protect trusses and accessories from contact with earth, corrosion, deformation, mechanical damage, or other deterioration when stored at project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cold-Formed Steel Trusses:
1. Aegis Metal Framing, a Division of MiTek Industries: www.aegismetalframing.com.
2. TrusSteel Division of Alpine Engineered Products, Inc: www.trussteel.com.
3. Nuconsteel (Nucor): www.nuconsteel.com
4. Steelway International: www.SteelwayIntl.com

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRUSS DESIGN REQUIREMENTS

A. Design: Calculate structural characteristics of cold-formed steel truss members according to AISI S100-12.

B. Structural Performance: Design, engineer, fabricate, and erect trusses to withstand specified design loads for project conditions within required limits.
1. Design Loads: As noted in the Structural Drawings.
2. Deflections: As noted in the Structural Drawings.:
3. Design trusses to accommodate movement attributable to temperature changes within a range of 120 degrees F without damage or overstressing, sheathing failure, undue strain on fasteners and anchors, or other deleterious effects.

2.03 COMPONENTS

A. Trusses: Light gage steel assemblies providing a complete horizontal framing system for locations indicated, ready for deck installation.
1. Truss Type, Span, and Height: As indicated on drawings.

2. Chord and Web Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 40,000 psi; minimum G60/Z180 coating; gages as required for load conditions; all edges rolled or closed.

B. Fasteners: Self-drilling, self-tapping screw fasteners with corrosion-resistant plated finish, as recommended by steel truss manufacturer and marked for easy identification.
   1. Welding: Comply with applicable provisions of AWS D1.1/D1.1M and AWS D1.3/D1.3M.

C. Bracing, Bridging, and Blocking Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 33,000 psi; minimum G60/Z180 coating; gages as required for load conditions.

2.04 FABRICATION

A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with secure connections, complying with manufacturer's recommendations and project requirements.
   1. Fabricate trusses using jig templates.
   2. Cut truss members by sawing, shearing, or plasma cutting.
   3. Fasten members in full compliance with instructions of manufacturer. Wire tying of framing members is not permitted.

B. Tolerances: Fabricate trusses to maximum allowable tolerance variation from plumb, level and true line of 1/8 inch in 10 feet.
   1. Up to 30 feet Long: Maximum plus or minus 1/2 inch from design length.
   2. Over 30 feet Long: Maximum plus or minus 3/4 inch from design length.
   3. Up to 5 feet High: Maximum plus or minus 1/4 inch from design height.
   4. Over 5 feet High: Maximum plus or minus 1/2 inch from design height.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine structure, substrates, and installation conditions. Notify Architect of unsatisfactory preparation. Do not begin installation until substrates have been properly prepared and unsatisfactory conditions have been corrected.

B. Proceeding with installation indicates installer's acceptance of substrate conditions.

3.02 INSTALLATION

A. Install cold-formed steel trusses in strict accordance with manufacturer's instructions and approved shop drawings, using approved fastening methods.

B. Install temporary erection bracing and permanent bracing and bridging before application of any loads. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at spacing indicated. Anchor trusses securely at bearing points.

C. Adequately distribute applied loads to avoid exceeding the carrying capacity of any one joint, truss, or other component.

D. Exercise care to avoid damaging truss members during lifting and erection and to minimize horizontal bending of trusses.

E. Removal, cutting, or alteration of any truss chord, web, or bracing member in the field is prohibited, unless approved in advance by Architect or the engineer of record and the truss manufacturer.

F. Repair or replace damaged members and complete trusses as directed and approved in writing by Architect or the engineer of record and the truss manufacturer.

G. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

H. Field Welding: In accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M, as applicable, and as follows:
   1. Connections: Provide fillet, flat, plug, or butt welds, as indicated.
   2. Minimum steel thickness for welded connections, 18 gage, 0.0478 inch.

I. Roof Trusses:
   1. Comply with recommendations of CFSEI 5000.
   2. Align truss bottom chords with load-bearing studs or continuously reinforce track as required to transfer loads to structure.
   3. Install continuous bridging and permanent truss bracing as indicated.
   4. Install roof cross bracing and diagonal bracing as indicated.

3.03 TOLERANCES

A. Install trusses to maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.

B. Space individual trusses not more than plus or minus 1/8 inch from plan location. Cumulative error in placement may not exceed minimum fastening requirements of sheathing or other material fastened to trusses.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000 - Quality Requirements.

3.05 PROTECTION

A. Protect trusses from damage by subsequent construction activities.

B. Repair or replace damaged trusses, truss members, and bracing members; obtain approval in advance by Architect or the engineer of record and the truss manufacturer for all cutting, repairs, and replacements.

C. Galvanizing Repairs: Bare steel, beyond the effect of zinc's sacrificial protection characteristics, shall be touched up with zinc-rich paint in accordance with ASTM A 780 and the paint manufacturer's instructions.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

B. Elevator sump pit grate

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 1200 - Structural Steel Framing: Structural steel column anchor bolts.

D. Section 05 2100 - Steel Joist Framing: Structural joist bearing plates, including anchorage.

E. Section 05 3100 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.

F. Section 05 5100 - Metal Stairs.

G. Section 05 5133 - Metal Ladders.

H. Section 05 5213 - Pipe and Tube Railings.

I. Section 09 9000 - Painting and Coating.

1.03 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; 2012.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

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 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.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

L. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

N. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 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.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design miscellaneous steel and iron under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Texas.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: Shapes, bar and plate shall conform to ASTM A 36/A 36M. Light gauge structural steel shall conform to ASTM A924, latest revision. All material shall be straight, free from mill scale, rust, pitting and dents that will detract from finished appearance when painted.

B. Steel Tubing: ASTM A500/A500M Grade B cold-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

F. Slotted Channel Fittings: ASTM A1011/A1011M.

G. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

H. Sheet Metal shall be open hearth, full pickled, cold rolled, annealed, patent leveled, entirely free from scale, waves and other defects.

I. Bolts, Nuts, and Washers: ASTM F3125/F3125M, galvanized to ASTM A153/A153M where connecting galvanized components.

J. Rivets shall conform to ASTM A-141, latest revision.

K. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

L. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

M. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. All workmanship must be first-class in all respects and any members not presenting a finished and workmanlike appearance will be rejected. All finished members shall be free from twists, bends and open joints. Work shall conform to all applicable requirement of AISC.

B. All members shall be true to length so that assembly may be done without fillers, except where same are required as detailed. There shall be no projecting edges or corners where different members are assembled. On exposed surfaces, welds shall be ground smooth and flush with parent metal. All coping, blocking or mitering shall be done with care. Sharp edges and corners caused by shearing or other tooling shall be eased where exposed.

C. All details and connections shall be close fitting and carefully made and fitted, and special care shall be exercised to produce a thoroughly neat and workmanlike appearance. All detail pieces shall be made in exact accordance with Detail Drawings with all projecting corners clipped and all filler pieces made flush. Provide all lugs, clips, connections, bolts, etc., necessary to complete fabrication and erection.

D. Unless otherwise shown on Drawings, all bolts remaining in the finished, exposed work shall have countersunk heads; nuts shall be hexagonal. Bolts shall be of proper length to permit full thread in the nut, but shall not project more than 1/4" beyond the face of the nut. Screws shall be countersunk Phillips head.

E. The Contractor shall provide all holes in his work required for the connection of the work of other trades.

F. There shall be no flame cutting of members in the field without the consent of the Architect. If consent is given, burned flame cut members shall be finished to an acceptable appearance that shall be equal of a sheared finish.

G. Burning shapes to length in the shop with a standard flame cutting machine will be permitted. Burning of holes will NOT be permitted in the shop or in the field.

H. Anchors for frames, floor angles and other miscellaneous iron members shown anchored into concrete or masonry shall be strap iron, bent to shape, or deformed bent bars welded to backs of members, extended with bent end for building in as conditions required and of sizes and spacing as noted. Where the size and spacing are not noted, anchors shall not be less than 1-1/2" x 1/4" for concrete and 1-1/2" x 1/8" for masonry to fit the jointing of the adjacent brick or masonry block work. Unless otherwise noted on the Drawings, anchors shall be spaced 3'-0" or less o.c.

I. Where anchors and plates or clips are to be built in for attachment of later work, bolts shall be placed in the plates or clips and welded to back with threaded ends extended as required.

J. For attaching work to masonry or concrete, where anchors or inserts cannot be built-in, provide approved type of cinch anchors and machine bolts or screws. Holes shall be accurately drilled.

K. Fit and shop assemble items in largest practical sections, for delivery to site.

L. Fabricate items with joints tightly fitted and secured.

M. Continuously seal joined members by intermittent welds and plastic filler.

N. 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.

O. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

P. Supply 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, prefabricated or hand formed crowned cap, or as detailed; prime paint finish.

B. Downspout Boots shall be fabricated from 16 gauge galvanized steel and field painted to match downspouts. See drawings for details.

C. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking, joists, and masonry; prime paint finish.

D. Lintels: As detailed; prime paint finish.

E. Door Frames for Overhead Door Openings and Wall Openings: Channel and Angle sections; prime paint finish.

F. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.

2.04 UTILITY TRENCH, DRAINS AND CASTINGS

A. In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, rolled trade names, and roughness.

B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

C. Manufactures:
1. ACO Drain systems: www.acodrain.us
2. McKinley Iron Works: www.mckinleytreegrate.com
3. Neenah Foundry Company: www.nfco.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

D. Provide rectangular grate at elevator sump pits equal to McKinley, Type 24”x24” PL grate with 24”x24” PGL.

2.05 FINISHES - STEEL

A. Prime paint steel items.
1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

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.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

G. All steel exposed to weather, set in concrete shall be painted with cold galvanized zinc, specification of U.S. Navy MIL-P-21035, U.S. Air Force MIL-P-26915A, equal to Hot Dip galvanized in cathodic protection.

2.06 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. The Contractor shall examine the construction to which his work is to be applied and shall notify the Architect in writing if deficiencies exist which are detrimental to the proper and timely installation of any work required under this section.

3.02 PREPARATION

A. The contractor shall examine the drawings and specifications with respect to the work shown or required under this section and related sections so as to insure the completeness of all work. Supplementary parts necessary to complete each item of miscellaneous iron and steel required under this section, such as bent plates, beams, columns, sleeves, clips, brackets, hangers, anchors, bolts and other fastenings and supports, though such parts are not shown on drawings or specified herein, shall be included.

B. The Contractor shall coordinate and schedule the work of this section with the work of other trades. Anchors, sleeves, framing, fastenings and other miscellaneous items to be embedded in concrete or masonry or required for securing miscellaneous iron and steel work to other construction, shall be furnished as required and so as not to delay the progress of the work.

C. The Contractor shall obtain field measurements of adjoining work as required to locate and fit the work of this section. He will be held responsible for the accurate fitting of his material to the building.

D. Storage and Handling: Miscellaneous steel shall be handled and delivered to the job in a manner that will prevent damage to the material. Store in a dry place, under cover, well protected from weather and all elements that will cause deterioration.

E. Clean and strip primed steel items to bare metal where site welding is required.

F. Supply 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. All parts shall be secured in a rigid and substantial manner and methods or attachment shall be concealed wherever practicable.

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.

F. After erection, prime welds, abrasionsand surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

G. Other trades will set and build in items of miscellaneous iron which are to be built into masonry or concrete, such as loose lintels, seat angles, door frames, curbs, sleeve inserts, brackets, lugs, anchors, etc. as required to complete all parts of the work.

H. All such items shall be fabricated and delivered by the miscellaneous iron trade, complete with bolts, anchors, clips, etc., ready for the other trades to set. This trade shall consult with the trades concerned and make delivery to the points designated by the latter to expedite the installation of delivered materials in their current locations and shall furnish setting drawings where required.

I. Where frames, curbs, and similar work are composed of several parts, only those parts upon which anchors occur will, unless otherwise specified, be set and built-in by the other trades ready to receive further field assembly by the miscellaneous iron contractor.

J. Where necessary to secure miscellaneous iron work to the structure by means of welding, expansion bolts, cinch anchors and similar connections, this trade shall, unless otherwise specified, do the work of laying out and installing such connections, installing the miscellaneous iron work and bolting up.

K. All other items of miscellaneous iron shall be furnished and completely installed and connections made by this trade.

L. Throughout the work of this trade, anchors and inserts shall be provided wherever possible for building in the adjoining work. Where lugs are shown or specified for building into adjoining masonry, the parts having lugs shall be erected in place before the masonry is built. Elsewhere, the work shall be brought to the building in as large pieces as practicable and attached to anchors or inserts during erection.

M. All parts of work exposed to view shall be left clean, smooth and neatly finished.

N. All freestanding steel handrails shall be embedded in the concrete slab unless noted otherwise.

O. Shelf angles and supports for masonry, etc., and slab edge plates shall be furnished and installed as shown.

P. All shelf angles shall be punched for bolts. Furnish and install bolts as required.

3.04 WELDING

A. All welding on steel, both shop and field, shall be done by the electric method in accordance with the American Welding Society specifications. Welder shall be especially skilled in this class of work and qualified by successfully passing the American Welding Society tests and have a current certificate.

B. Welds shall be solid and homogeneously a part of the metals joined and free from pits or incorporated slag and scale. Surfaces of welds shall be smooth and regular and shall be full area indicated or required to develop the required strength of the joints. Where exposed, welds shall be ground smooth and flush with the parent metal, so as to be imperceptible after painting.

C. If directed by Architect, welds, selected at random, shall be tested by an approved laboratory and any welds not complying with the specifications shall be removed and replaced with satisfactory work. The cost of test shall be borne by the Contractor in all cases in which welding fails to comply with the specifications, otherwise by Owner. The cost of replacing condemned welds, plus the cost of replacing other materials damaged incidental thereto, shall be borne by the Contractor.

D. Galvaweld: All welds on galvanized surfaces performed after galvanizing shall be Galvaweld coated.

3.05 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 concrete treads.

B. Structural steel stair framing and supports.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

B. Section 03 3000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

C. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

D. Section 05 5000 - Metal Fabrications.

1.03 REFERENCE STANDARDS

A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.

B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2017.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

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 A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

K. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

L. 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.

M. 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.

N. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

Q. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

R. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 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.
   3. Shop drawing sheets that include engineering information designed by the Contractor's Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Pracetice Act. Sheets that do not provide information designed by the Contractor's Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

C. Design Data: As required by authorities having jurisdiction.

D. Welders' Certificates.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in Texas, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

C. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

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 complying with the 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 complying with the applicable local code.
   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. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.

a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
b. Welds Exposed to View: Ground smooth and flush.
c. Mechanical Joints: Butted tight, flush, and hairline.
d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
e. Exposed Edges and Corners: Eased to small uniform radius.
f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

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 CONCRETE TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
1. Concrete Depth: 2 inches, minimum.
2. Tread Pan Material: Steel sheet.
3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum. For lengths over 5'-6" use 12 gage. Where terrazzo is used as a finish on the treads provide 10 gauge risers for all tread lengths.
4. Pan Anchorage to Stringers: Continuously welded, from top or bottom.
5. Concrete Reinforcement: Welded wire mesh.
6. Concrete Finish: Steel troweled.

D. Risers: Same material and thickness as tread pans.
1. Riser/Nosing Profile: Sloped riser with rounded nosing as specified in Section 05 5516.

E. Stringers: Rolled steel channels.
1. Stringer Depth: As indicated on drawings.
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: As specified in Section 05 5213 and/or Section 05 7000. Reference drawings for locations of each ytpe where required.

H. Finish: Shop- or factory-prime painted.

I. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.03 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.

E. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

F. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.

G. Concrete Fill: Type specified in Section 03 3000.

H. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.04 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.05 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.

D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
   1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

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 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 05 5133
METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop-fabricated metal ladders.

B. Ladder safety systems.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications

B. Section 09 9000 - Painting and Coating

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; current edition.

B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.

C. 29 CFR 1910.140 - Personal fall protection systems; Current Edition.

D. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008.

E. ANSI/ASSP Z359.11 - Safety Requirements for Full Body Harnesses; 2014.

F. ANSI/ASSP Z359.12 - Connecting Components for Personal Fall Arrest Systems; 2009.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 SUBMITTALS

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

B. Shop Drawings:

1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design miscellaneous steel and iron under direct supervision of a Professional Engineer experienced in design of this work and licensed in Texas.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M Grade B cold-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

F. Bolts, Nuts, and Washers: ASTM F3125/F3125M, galvanized to ASTM A153/A153M where connecting galvanized components.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, 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. Continuously seal joined members by intermittent welds and plastic filler.

D. 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.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply 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 LADDERS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 by 2 inches members spaced at 20 inches.
   2. Rungs: One inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 7 inches from wall surface.
   4. Provide safety system for ladders over 24'-0" high as required to meet OSHA standards.
   5. Provide ladders at elevator pit, roof hatch, floor hatch and roof-to-roof ladders where noted on the drawings or where required by code.

2.04 LADDER SAFETY SYSTEMS

A. Ladder Safety System: Comply with 29 CFR 1910.29, 29 CFR 1926.1053, and Section 7 of ANSI A14.3; ladder safety system allows the worker to climb up and down using both hands; does not require the employee continuously, hold, push, or pull any part of the system while climbing.
   1. Install on new fixed ladders over 24 feet in height.
   2. Anchorage: Fixed ladder meeting requirements of 29 CFR 1910.23.
   3. Flexible Carrier: Fixed 3/8 inch diameter galvanized steel wire rope lifeline with shock absorber and top, bottom and intermediate supports.
   4. Rigid Carrier: Fixed galvanized steel U-shaped slotted track with top, bottom and intermediate supports.
   5. Fall Arrester: Stainless steel and aluminum manual pass-through carrier sleeve fall arrester; compatible with carrier.

B. Personal Fall Arrest System Components; 29 CFR 1910.140:
   1. Body Support: Full body harness meeting requirements of ANSI/ASSP Z359.11; equipped with front or hip D-rings for attachment to climbing ladder fall arrest system.

2. Connecting Means: Connecting hardware, such as a locking carabiner, meeting requirements of ANSI/ASSP Z359.12; compatible with fall arrester and body support harness.

2.05 FINISHES - STEEL

A. Prime paint steel items.
   1. Do not prime surfaces in direct contact with concrete.
   2. Do not prime surfaces where field welding is required.

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.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.06 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.

B. Confirm that the ladder structure to which the ladder safety system is installed is capable of withstanding the loads applied by the system in the event of a fall.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply 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. Install ladder safety system in accordance with manufacturer's instructions.

C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components as indicated.

E. Perform field welding in accordance with AWS D1.1/D1.1M.

F. Obtain approval prior to site cutting or making adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed , 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.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5516
METAL STAIR NOSINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Interior Stair Nosings

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete

B. Section 05 5100 - Metal Stairs

1.03 REFERENCE STANDARDS

A. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

B. ADAAG, Americans with Disabilities Act Accessibility Guidelines.

C. TAS, Texas Accessibility Standards

1.04 SUBMITTALS

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

B. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades; including color samples.
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.05 QUALITY ASSURANCE

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

C. Perform shop and/or field welding required in connection with the work of this Section in strict accordance with pertinent recommendations of the American Welding Society.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 6000 - Product Requirements.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. American Safety Tread Company: www.americansafetytread.com

B. Balco, Inc.: www.balcousa.com

C. Schluter-Systems: www.schluter.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Stair Nosings: Reference drawings for locations.
   1. Description: Roll-formed stainless steel (type 304 = V2A) profile with ribbed, 1-3/16" wide exposed surface with rounded leading edge, and integrated trapezoid-perforated anchoring leg.
      a. Equal to Schluter - TREP-E
      b. Height: Height as required.
      c. Material and Finish:
         1) Refer to 01 6210-Scheulde of Materials and Colors.
      d. Accessories:
         1) End Caps: Provide matching end caps
   2. Description: Roll formed 304 (1.4301 = V2A) (EB) brushed stainless steel, perforated anchoring leg, square outer corner with 1/4" radius along the surface edge.
      a. Equal to Schluter - QUADEC.
      b. Height: Height as required.
      c. Material and Finish:
         1) Refer to 01 6210-Scheulde of Materials and Colors.
      d. Accessories:
         1) Connector (stainless steel)

2.03 ACCESSORIES

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

2.04 FABRICATION

A. Except as otherwise shown on the Drawings or the approved Shop Drawings, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.

B. Fabricate with accurate angles and surfaces which are true to the required lines and levels, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners wherever possible.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the area and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.02 INSTALLATION

A. General
   1. Set work accurately into position, plumb, level, true and free from rack.
   2. Anchor firmly into position.
   3. Where field welding is required, comply with AWS recommended procedures of manual-shielded metal-arc welding for appearance and quality of weld and for methods to be used in correcting welding work.
   4. Grind exposed welds smooth and touch-up shop prime coats.
   5. Do not cut, weld, or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for bolted or screwed field connections.

3.03 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

3.04 PROTECTION

A. Protect installed Ladders from subsequent construction operations.

3.05 MAINTENANCE

A. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 05 7000
DECORATIVE METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Railing and guardrail assemblies.

B. Wall-mounted handrails.

C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Supports.

B. Section 05 5100 - Metal Stairs: Handrails other than those specified in this section.

C. Section 09 2982 - Gypsum Board: Placement of backing plates in stud wall construction.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

D. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 2016.

E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

G. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013, with Editorial Revision.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Schedule and conduct a preinstallation meeting one week before starting work of this section. Attendees shall include, but not be limited to:
   1. Contractor.
   2. Manufacturer's representative.
   3. Architect.
   4. Other subcontractors of adjacent work.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.

B. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.

C. Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.

D. Manufacturer's Installation Instructions.

E. Maintenance Data: Manufacturer's instructions for care and cleaning.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing decorative stairs and railing systems and acceptable to manufacturer.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of experience.

C. Templates: Supply installation templates, reinforcing and required anchorage devices.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against damage during transit, delivery, storage, and installation at site.

B. Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.

1.08 FIELD CONDITIONS

A. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F and maximum 95 degrees F.

B. Maintain ambient temperature of space at minimum 65 degrees F and maximum 95 degrees F for 24 hours before, during, and after railing installation.

1.09 WARRANTY

A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 RAILING SYSTEMS

A. Railing Systems - General: Factory- or shop-fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure, and in largest practical sizes for delivery to site.
   1. Performance Requirements: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
      a. Lateral Force: 75 lb minimum, at any point, when tested in accordance with ASTM E935.
      b. Distributed Load: 50 lb/ft minimum, applied in any direction at the top of the handrail, when tested in accordance with ASTM E935.
      c. Concentrated Loads on Intermediate Rails: 50 psf, minimum.
      d. Concentrated Load: 200 lbs minimum, applied in any direction at any point along the handrail system, when tested in accordance with ASTM E935.
      e. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   2. Assembly: Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
   3. Joints: Tightly fitted and secured, machined smooth with hairline seams.
   4. Field Connections: Provide sleeves to accommodate site assembly and installation.

B. Metal Railing: Engineered, post-supported railing system with metal infill.
   1. Configuration: Guardrail with separate handrail.
   2. Top Rail: 2 inch diameter pipe or tube.
   3. Grip Rail: Round, stainless steel, 1-1/2 inch diameter.
   4. Decorative Flanges for Embedded Posts: Circular, collared cover plate without screw holes.
   5. Wall Mounted Components: Components necessary to support railing with 1-1/2 inch clearance from wall, and as follows:

a. Underslung support brackets: Supports at 60 inches, maximum.
b. Wall return without support: Terminates 1/4 inch from side wall.

6. Handrail Brackets: Same metal as railing.
7. Fasteners: Concealed.
8. Infill at Picket Railings: Vertical pickets.
   a. Horizontal Spacing: Maximum 4 inches on center.
   b. Material: Solid steel bar.
   c. Size: 1/2 inch diameter.
9. End and Intermediate Posts: Same material and size as top rails.
   a. Horizontal Spacing: As indicated on drawings.
   b. Mounting: Welded.

C. Wall-Mounted Handrail:
   1. 1-1/2 inch diameter stainless steel; No. 6 satin finish..
   2. Internal Connection Sleeves: Sleeve, material compatible with handrail and top cap material.
   3. Handrail Brackets: Manufacturer's standard stainless steel brackets.
      a. Mounting: Wall.
      b. Finish: No. 6 satin finish..
   4. Comply with TAS and ADA Standards.

2.02 MATERIALS

A. Stainless Steel Components:
   1. ASTM A666, Type 316.
   2. Stainless Steel Tubing: ASTM A554, Type 316, 16 gage, 0.0625 inch minimum metal thickness, 1-1/2 inch diameter.
   3. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 316.
   4. Stainless Steel Finish: No. 6 satin finish..

2.03 ACCESSORIES

A. Non-Weld Mechanical Fittings for Stainless Steel Railings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

B. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. Exposed Fasteners: No exposed bolts or screws.

C. Carbon Steel Bolts and Nuts: ASTM A307.

D. Sealant: Silicone; clear.

E. Finish Touch-Up Materials: As recommended by manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate and site conditions are acceptable and ready to receive work.

B. Verify field dimensions of locations and areas to receive work.

C. Notify Architect immediately of conditions that would prevent satisfactory installation.

D. Do not proceed with work until detrimental conditions have been corrected.

3.02 PREPARATION

A. Protect existing work.

B. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

3.03 INSTALLATION

A. Comply with manufacturer's drawings and written instructions.

B. Anchor securely to structure.

C. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

D. Weld connections that cannot be shop welded due to size limitations.
   1. Weld in accordance with AWS D1.1/D1.1M.
   2. Match shop welding and bolting.
   3. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.05 FIELD QUALITY CONTROL

A. Field Services: Provide the services of the manufacturer for field observation of installation of railings.

3.06 CLEANING

A. Remove protective film from exposed metal surfaces.

B. Glass and Glazing: Clean glazing surfaces; remove excess glazing sealant compounds, dirt, and other substances.

3.07 PROTECTION

A. Protect installed components and finishes from damage after installation.

B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
   1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-structural dimension lumber framing.
B. Structural Composite Lumber
C. Sheathing.
D. Roofing nailers.
E. Roofing cant strips.
F. Preservative treated wood materials.
G. Fire retardant treated wood materials.
H. Miscellaneous framing and sheathing.
I. Concealed wood blocking, nailers, and supports.
J. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.
B. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
C. Section 07 2500 - Weather Barriers
D. Section 07 7200 - Roof Accessories: Prefabricated roof curbs.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
C. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).
D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
F. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
G. PS 20 - American Softwood Lumber Standard; 2015.
H. SPIB (GR) - Grading Rules; 2014.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide technical data on vendor, vendor, vendor, and vendor.
C. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.

D. Samples: For rough carpentry members that will be exposed to view, submit three samples, 12by12 inch in size illustrating wood grain, color, and general appearance.

E. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
   1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
   2. Identify plywood sheathing as to grade, use, span rating and exposure classification by the mark of the APA The Engineered Wood Association.
   3. Use extreme care when off-loading lumber to prevent damage, splitting and breaking of materials. Split or broken plywood sheathing will not be accepted for use in the work of this Section.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

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. Grading Agency: Any 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.
   3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 DIMENSION LUMBER

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: 19 percent maximum.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Any allowed under referenced grading rules.
   2. Grade: No. 2.

E. Joist and Rafter Framing (2 by 6 through 4 by 16):
   1. Species: Spruce-Pine-Fir (South).
   2. Grade: No. 2.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: No. 2 or Standard Grade.

2.03 STRUCTURAL COMPOSITE LUMBER

A. System Description
   1. Design Requirements: Design gate system to withstand Miami/Dade County 110 MPH steady wind and 130 MPH gusting wind tests.

B. Warranties
   1. Furnish manufacturer's 10-year warranty providing coverage against checking, splitting, splintering, rotting, structural damage from termites and fungal decay of composite wood.

C. Materials
   1. Composite Wood:
      a. Reclaimed wood and plastic with integral coloring; free from toxic chemicals and preservatives.

D. Components
   1. Gate System: as detailed on the drawings.
      a. Components:
         1) Pickets
         2) Top and bottom rails.
         3) Bottom rail inserts.
      b. Surface texture: Smooth.
      c. Color: as selected by Architect.

E. Accessories
   1. Fasteners: Galvanized or corrosion-resistant coated steel.

F. Manufacturers:
   1. Trex Company: www.trex.com
   2. iLevel by Weyerhaeuser: www.ilevel.com.
   3. Boise Cascade: www.bc.com.
   4. Georgia-Pacific Corp.: www.gp.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.04 EXPOSED BOARDS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Moisture Content: S-dry (19 percent maximum).

C. Surfacing: S4S.

D. Species: Douglas Fir.

E. Grade: No. 2, 2 Common, or Construction.

2.05 CONSTRUCTION PANELS

A. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
   1. Bond Classification: Exposure 1.
   2. Span Rating: 40/20.
   3. Thickness: 5/8 inch, nominal for standing seam metal roofs, 2 layers of 3/8 inch, nominal for curved standing seam metal roofs and 3/4 inch for asphalt shingle roofs.
   4. Within 40 feet in any direction of any 4-hour firewall, install fire-retardant treated plywood sheathing.
   5. Provide metal clip supports between sheets

B. Other Applications: Thickness as noted on the drawings
   1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
   2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   3. Other Locations: PS 1, C-D Plugged or better.

2.06 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. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

3. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

D. Water-Resistive Barrier: As specified in Section 07 2500.

2.07 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. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. 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. Fire Retardant Treatment:
   1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat all exterior rough carpentry items.
      c. Do not use treated wood in direct contact with the ground.
   2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items as indicated .
      c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Preservative Pressure Treatment of Lumber Above Grade: {\rs\#1}, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber exposed to weather.
      c. Treat lumber in contact with roofing, flashing, or waterproofing.
      d. Treat lumber in contact with masonry or concrete.
      e. Treat lumber in other locations as indicated.
   2. Preservative Pressure Treatment of Plywood Above Grade: {\rs\#1}, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
      a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
      b. Treat plywood in contact with roofing, flashing, or waterproofing.

c. Treat plywood in contact with masonry or concrete.
d. Treat plywood in other locations as indicated.

3. Preservative Pressure Treatment of Lumber in Contact with Soil: {\rs\#1}, Use Category UC4A, Commodity Specification A using waterborne preservative to 0.40 lb/cu ft retention.
   a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
   b. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

C. Coordinate installation of rough carpentry members specified in other sections.

3.02 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.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes.

E. Install horizontal spanning members with crown edge up and not less than 3 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Provide bridging at joists in excess of 8 feet span at mid-span. Fit solid blocking at ends of members.

H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 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 framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. 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.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.

3.05 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 all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
   1. Comply with "Code Plus" provisions of above-referenced guide.

B. Comply with system manufacturer’s written instructions for installing plywood.
   1. Install plywood sheathing continuously, with the strength of the axis of the panel across supports. Plywood sheathing shall be installed with offset joints. Butt end joints over supports, providing a space of 1/16” at panel ends and 1/8” at panel edges.
   2. Fasten each layer of plywood sheathing using #13-14 Dekfast screws with Phillips drive truss heads in a noncorrosive base material in sufficient length to penetrate the metal decking by 1/2". Use a screw pattern of 6" spacing along exterior edges and a 12" interior grid pattern per UL90 class 580 uplift. Provide a minimum of 32 fasteners per sheet. Plywood shall be fastened as an independent system for the insulation. Where drawings indicate multiple layers of plywood, stagger second layer in both directions from pattern below. At curved roof structures, plywood shall conform to the radius of the structure.
   3. Within 40 feet in any direction of any 4-hour firewall, install fire-retardant treated plywood sheathing.
   4. Provide metal clip supports between sheets at center spans unless tongue and groove plywood sheathing is used.
   5. Cover plywood sheathing as soon as possible with specified underlayment for protection against excessive moisture prior to roofing application.
   6. Do not install plywood sheathing in adverse weather conditions. Plywood sheathing may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, crook, mildew, fungus, or mold as well as for improper curing and firming prior to installation. Wet or damaged plywood sheathing will be rejected.

3.07 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.08 TOLERANCES

A. Framing Members: 1/8 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 3/8 inch in 30 feet maximum.

C. Variation from Plane (Other than Floors): 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7000.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.

B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 08 1416 - Flush Wood Doors.

C. Section 09 9000 - Painting and Coating: Painting and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

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

B. Product Data:
   1. Provide data on fire retardant treatment materials and application instructions.
   2. Provide instructions for finish hardware.

C. 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 the information required by {\rs\#1}.
   3. Include certification program label.

D. Samples: Submit two samples of finish plywood, 6 by 6 inch in size illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim 6 inches long.

1.06 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 within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
   2. Single Source Responsibility: Provide and install this work from single fabricator.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

C. Protect from moisture damage.

D. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

2.02 LUMBER MATERIALS

A. Hardwood Lumber: As noted on the drawings, with a maximum moisture content of 6 percent, of quality suitable for transparent finish.

2.03 SHEET MATERIALS

A. Hardwood Plywood: Face species as indicated, plain sawn, book matched, veneer core, glue type as recommended for application.

B. Hardboard: ANSI A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth one side (S1S).

C. Pegboard: Pressed wood fiber with resin binder, standard grade; 1/4 inch thick, with holes spaced at 1 inch on center in both directions.

2.04 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Fastening:
   1. Install items straight, true, level, plumb, and firmly anchored in place.
   2. Where blocking or backing is required, coordinate as necessary with other trades to ensure placement of required backing and blocking in a timely manner.
   3. Nail trim with finish nails of proper dimension to hold the member firmly in place without splitting the wood.
   4. Nail exterior trim with galvanized nails, making joints to exclude water and setting in waterproof glue or the sealant described in Section 07 9200 - Joint Sealants of these Specifications.

2.05 FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with {\rs\#1}, Section 5 - Finishing for grade specified and Section 09 9000 - Painting and Coating, as follows:
   1. Transparent:

E. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Install components with nails at 8 inch on center.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 9000.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 8316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 REFERENCE STANDARDS

A. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor; 2013a.

B. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

D. FM 4880 - Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials; 2017.

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; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 8 by 10 inch in size illustrating material and surface design of panels.

D. Submit Material Safety Data Sheets for the following items:
   1. All mastics, glues and adhesives
   2. Sealant (interior use only)

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Crane Composites, Inc: www.cranecomposites.com/#sle.
   2. Marlite, Inc: www.marlite.com/#sle.
   3. Nudo Products, Inc: www.nudo.com/#sle.
   4. Panolam Industries International, Inc: www.panolam.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels at drywall partitions behind service sinks:
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: 0.075 inch.
   3. Surface Design: Smooth.
   4. Color: White.
   5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.

1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
2. Class 1 fire rated when tested in accordance with FM 4880.
3. Scratch Resistance: Barcol hardness score greater than 50, when tested in accordance with ASTM D2583.
4. Abrasion Resistance, Taber Abrasion Test, CS-17 abrasive wheels with 1,000 g weight: Weight loss after 25 cycles of no more than 0.038 percent.
5. Impact Strength, ASTM D 5420: 11 in-lbs (0.59 J), showing no visible damage on finish side.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet Waterproofing:

B. Drainage panels.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete substrate.

B. Section 07 9200 - Joint Sealants: Sealing moving joints in waterproofed surfaces that are not required to be treated in this section.

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).

C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.

D. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2010).

E. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008 (Reapproved 2015).

F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2017.

G. ASTM D5295/D5295M - Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems; 2014.

H. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes; 1993, with Editorial Revision (2014).

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a.

J. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a, with Editorial Revision (2013).

K. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.04 SUBMITTALS

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

B. Product Data: Provide data for membrane, surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and acceptable installation temperatures.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Membrane 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 work of the type specified and with at least three years of documented experience.

1.06 MOCK-UP

A. Construct mock-up 100 sq ft of vertical waterproofed panel; to represent finished work including internal and external corners, seam jointing, attachment method, counterflashings, drainage panel, base flashings, control joints, expansion joints, and protective cover.

B. Locate where directed.

C. Mock-up may remain as part of this Work.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

C. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 WATERPROOFING APPLICATIONS

A. Self-Adhered Modified Bituminous Sheet Waterproofing: Use at Vertical Surfaces.
   1. Cover with drainage panel.

2.02 MEMBRANE MATERIALS

A. Self-Adhered Modified Bituminous Sheet Membrane:
   1. Basis of Design: GCP Applied Technologies; Bituthene System 4000 Membrane: gcpat.com.
   2. Thickness: 60 mil (0.060 inch). Nominal.
   3. Sheet Width: 36 inch, minimum.
   4. Tensile Strength:
      a. Film: 5000 pounds per square inch, minimum, measured according to ASTM D882 and at grip-separation rate of 2 inches per minute.
      b. Membrane: 325 pounds per square inch, minimum, measured according to ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches per minute.
   5. Elongation at Break: 300 percent, minimum, measured according to ASTM D412.
   6. Water Vapor Permeance: 0.05 perm, maximum, measured in accordance with ASTM E96/E96M.
   7. Low Temperature Flexibility: Unaffected when tested according to ASTM D1970/D1970M at minus 20 degrees F, 180 degree bend on 1 inch mandrel.
   8. Peel Strength: 9 pounds per inch, minimum, when tested according to ASTM D903.
   9. Lap Adhesion Strength: 5 pounds per inch, minimum, when tested according to ASTM D1876.
   10. Puncture Resistance: 50 pounds, minimum, measured in accordance with ASTM E154/E154M.

11. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
12. Hydrostatic Resistance: Resists the weight of 200 feet when tested according to ASTM D5385/D5385M.
13. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
14. Manufacturers:
    a. Carlisle Coatings & Waterproofing Incorporated: www.carlisle-ccw.com.
    b. GCP Applied Technologies: www.gcpat.com/sle.
    c. W.R. Meadows, Inc: www.wrmeadows.com/sle.
    d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Seaming Materials: As recommended by membrane manufacturer.

B. Membrane Sealant: As recommended by membrane manufacturer..

C. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.

D. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
   1. Composition: Dimpled polystyrene core; polypropylene filter fabric.
      a. Manufacturers:
         1) Basis of Design: GCP Applied Technologies; Hydroduct 220.
         2) Substitutions: See Section 01 6000 - Product Requirements.

E. Flexible Flashings: Type recommended by membrane manufacturer.

F. Counterflashings: Type as specified in Section 07 6200.

G. Termination Bars: Aluminum; compatible with membrane and adhesives.

H. Adhesives: As recommended by membrane manufacturer.

I. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.

E. Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.

F. Prepare building expansion joints at locations as indicated on drawings.

G. Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

H. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate according to ASTM D5295/D5295M.
   1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.
   2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in the reference standard.
   3. Remove and replace areas of defective concrete as specified in Section 03 3000.
   4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in the referenced standard.
   5. Test concrete surfaces as described in the referenced standards. Verify surfaces are ready to receive adhesive bonded waterproofing membrane system.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.

D. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

G. Coordinate with drain installation; see drawings.

H. Install building expansion joints at locations as indicated on drawings.

I. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

J. Extend membrane up intersecting surfaces at membrane perimeter minimum 6 inches above horizontal surface for first ply and 6 inches at subsequent plies laid in shingle fashion.

K. Seal membrane and flashings to adjoining surfaces.

3.04 INSTALLATION - DRAINAGE PANEL

A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.

B. Adhere drainage panel to substrate with compatible adhesive.

3.05 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 1900
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water repellents applied to exterior and interior cast stone masonry surfaces.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 – Unit Masonry.

B. Section 04 7200 – Cast Stone Masonry.

C. Section 07 9200 – Joint Sealants.

1.03 REFERENCE STANDARDS

A. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).

B. ASTM D5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes, and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2013).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite Architect and Owner.

1.05 SUBMITTALS

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

B. Product Data: Provide product description, limitations, and chemical composition.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

D. Manufacturer's Field Reports: Report whether manufacturer's "best practices" are being followed; if not, state corrective recommendations. Email report to Architect the same day as inspection occurs; mail report on manufacturer's letterhead to Architect within 2 days after inspection.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.

1.07 MOCK-UP

A. Prepare a representative surface 36 inch by 36 inch in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

B. Locate where directed.

C. Accepted mock-up may remain as part of the Work.

1.08 FIELD CONDITIONS

A. Protect liquid materials from freezing.

B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
   1. Diedrich Technologies: www.diedrichtechnologies.com
   2. PROSOCO, Inc: www.prosoco.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
   1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
   2. Number of Coats: 1 or 2 coats as recommended by the manufacturer.
   3. VOC Content: Less than 100 g/L, when tested in accordance with ASTM D3960 or ASTM D5095.
   4. Water-based siloxane, silane, or blend that reacts chemically with concrete and masonry.
      a. Basis of Design: Sure Klean Weather Seal Siloxane PD.
      b. Apply with low-pressure spray, brush or roller.
      c. Typical Technical Data:
         1) Form: cloudy white liquid, odorless
         2) Specific Gravity: 0.996
         3) pH: 4 to 5
         4) Weight/Gallon: 8.29 pounds
         5) Active Content: 7 percent
         6) Total Solids: 4 percent ASTM D5095
         7) Flash Point: greater than 212 degrees F (greater than 100 degrees C) ASTM D 3278
         8) Freeze Point: 32 degrees F (0 degrees C)
         9) VOC Content: less than 30 grams per Liter, Low Solids Coating.
      d. Locations: Apply at exterior and interior cast stone.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

A. Protection of Adjacent Work:
   1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
   2. Protect adjacent surfaces not intended to receive water repellent.

B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.

D. Remove loose particles and foreign matter.

E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.

F. Scrub and rinse surfaces with water and let dry.

G. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.

B. Apply at rate recommended by manufacturer, continuously over entire surface.

C. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

D. Provide manufacturer's field service representative to inspect preparation and application work to ensure that manufacturer's "best practices" for preparation and application are being followed.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at masonry cavity wall construction and exterior wall behind masonry veneer, MCM and metal panel wall finish.

B. Batt insulation in exterior wall construction.

C. Semi-Rigid Board/Blanket insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

D. Acoustical batt insulation for interior walls and above ceilings.

E. Mineral wool insulation for fire safing.

1.02 RELATED REQUIREMENTS

A. Section 07 2200 - Roof and Deck Insulation: Insulation specified as part of roofing system.

B. Section 07 2500 - Weather Barriers: Separate air barrier and vapor retarder materials.

C. Section 07 8400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

D. Section 09 2982 – Gypsum Board.

E. Section 09 5100 – Acoustical Ceilings.

1.03 REFERENCE STANDARDS

A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2017.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

F. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016a.

G. BIA - The Brick Industry Association; Tech Note on Brick Construction, 28B Revised II.

H. ICC (IECC) - International Energy Conservation Code 2015.

I. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing 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.

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

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

E. Closeout Submittals:
   1. Submit under provisions of Section 01 7800 – Closeout Submittals

2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Procedures for the following items:
    a. All mastics, glues, and adhesives.
    b. Thermal insulation (excluding fiberglass, foam, rubber).

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 FOAM BOARD INSULATION MATERIALS

A. Polyisocyanurate (ISO) Board Insulation with Facers Both Sides, installed on masonry wall, behind MCM or metal wall panels where indicated: Rigid cellular foam, complying with ASTM C1289; Type I, aluminum foil both faces; Class 1 or 2.
    1. Classifications:
        a. Type I: Faced with aluminum foil on both major surfaces of core foam.
            1) Class 1 or Class 2 - Glass fiber reinforced or non-reinforced core foam.
    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. 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.
    5. Compressive Strength: 25 psi at vertical locations.
    6. Board Size: 48 by 96 inch, cut to fit locations indicated. Thickness as noted on the drawings.
    7. Thermal Resistance: R-value of 6.0 per inch, minimum.
    8. Board Edges: As tested to be in compliance with NFPA 285.
    9. Manufacturers:
        a. Atlas Roofing Corporation: www.atlasroofing.com/sle.
        b. Carlisle Coatings & Waterproofing, Inc: www.carlisleccw.com/sle.
        c. Dow Chemical Company: www.dow.com/sle.
        d. Firestone Building Products: www.firestonebpco.com.
        e. GAF: www.gaf.com/sle.
        f. Hunter Panels, LLC: www.hunterxci.com.
        g. Johns Manville: www.jm.com/sle.
        h. Ox Engineered Products: www.oxengineeredproducts.com/#sle.
        i. Rmax Inc: www.rmax.com.
        j. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIBERBOARD INSULATION MATERIALS

A. Glass Fiber Semi-Rigid Board/Blanket Insulation: Low density board, in accordance with ASTM C553, Type III.
    1. Provide in shim spaces, crevices in exterior wall/roof and expansion joints as detailed on the drawings.
    2. Facing: None, unfaced.
    3. Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.
    4. Smoke Developed Index: 50 or less, when tested with facing, if any, in accordance with ASTM E84.
    5. Board Size: 24 by 48 inch.
    6. Board Thickness: 1 inch.
    7. Board Edges: Square.
    8. Maximum Density: 1.6 pounds per cubic foot, nominal.

9. Manufacturers:
    a. CertainTeed Corporation: www.certainteed.com.
    b. Johns Manville: www.jm.com.
    c. Knauf Insulation: www.knaufnorthamerica.com
    d. Owens Corning Corporation: www.ocbuildingspec.com.
    e. Substitutions: See Section 01 6000 - Product Requirements.

B. Mineral Fiberboard Insulation (Rock Mineral Wool): Moisture Resistant High Density Rigid Mineral Fiber, installed on masonry walls, over exterior sheathing, behind MCM or metal wall panels where indicated, ASTM C612, Type IV B; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
2. Board Size: 48 by 96 inches.
3. Thermal Resistance: R-value of 4.0 per inch at 75 degrees F, minimum, when tested according to ASTM C518.
4. Maximum Density: 8.0 pounds per cubic foot, nominal.
5. Products:
    a. Johns Manville: www.jm.com/#sle.
    b. ROCKWOOL (ROXUL, Inc): www.rockwool.com/#sle.

2.03 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
4. Formaldehyde Content: Zero.
5. Thermal Resistance: R-value of 11 at 3.5" and 19 at 6".
6. Facing: Unfaced.
7. Manufacturers:
    a. CertainTeed Corporation: www.certainteed.com.
    b. Johns Manville: www.jm.com.
    c. Knauf Insulation: www.knaufnorthamerica.com
    d. Owens Corning Corporation: www.ocbuildingspec.com/sle.
    e. Substitutions: See Section 01 6000 - Product Requirements.

B. Acoustical Batt Insulation:
1. Provide sound attenuation batts within interior walls and above ceilings, where indicated.
2. Glass fiber composition, unfaced.
    a. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
    b. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
    c. Thickness: 3.5 or 6 inch, nominal for given location.
    d. Facing: Unfaced.
3. Manufacturers:
    a. CertainTeed Corporation: www.certainteed.com.
    b. Johns Manville: www.jm.com.
    c. Knauf Insulation: www.knaufnorthamerica.com.
    d. Owens Corning Corporation: www.ocbuildingspec.com.
    e. Substitutions: See Section 01 6000 - Product Requirements.

2.04 FIRE SAFING INSULATION

A. Mineral Fiber Batt Insulation (Mineral Wool): Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.

1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
2. Where indicated or required, provide as fire safing of through penetrations, joint systems and perimeter containment in rated assemblies.
3. Size and Density: As required to prevent passage of fire between floors or through walls for rating stated.
4. Manufacturers:
   a. Johns Manville: www.jm.com/#sle.
   b. ROCKWOOL (ROXUL, Inc): www.rockwool.com/#sle.
   c. Thermafiber, Inc: www.thermafiber.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

A. Air Barrier Sheet or Air Barrier Coating: See Section 07 2500.

B. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

C. 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.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

C. Install Iboard insulation on masonry walls, behind MCM or Metal Wall Panels in accordance with fire resistance requirements shown on the drawings and as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   1. Protect edges at door and window openings or other penetrations as tested in accordance with NFPA 285.
   2. Place boards to maximize adhesive contact.
   3. Butt edges and ends tightly to adjacent boards and protrusions.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

E. Install boards to fit snugly between wall ties.
   1. Place boards to maximize adhesive contact.
   2. Butt edges and ends tightly to adjacent boards and protrusions.

F. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.02 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Wall Sound Insulation: Install Insulation in all metal stud walls unless noted otherwise. Do not install insulation between studs where plumbing lines occur.

F. Ceilling Sound Insulation: Install above the entirety of all offices, restrooms, and workrooms and any other areas defined on the drawings and at the perimeter of all teaching spaces. Place sound isolation batts 2’-0” minimum each side parallel to the designated wall and across the top of the wall at ceiling and wall intersection of walls designated to have sound isolation batts.

G. Coordinate work of this section with construction of air barrier seal specified in Section 07 2500.

3.03 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2119
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation.
   1. In underside of structure and crawl space.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

C. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.04 SUBMITTALS

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

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Certificates: Certify that products of this section meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Provide insulation produced by a single and approved manufacturer.

B. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than five years of documented experience.

C. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum five years of documented experience.

1.06 MOCK-UP

A. Locate where directed.

B. Accepted mock-up may remain as part of the Work.

1.07 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Foamed-In-Place Insulation: In underside of structure and crawl space;
   1. Carlisle Polyurethane Systems: www.carlislepolyurethane.com/#sle.
   2. Demilec LLC: www.demilec.com/#sle.

3. Henry Company: www.henry.com/#sle.
4. Icynene-Lapolla: www.icynene.com/#sle.
5. Johns Manville: www.jm.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Foamed-In-Place Insulation: In underside of structure and crawl space, provide Low-density, flexible, open celled, water vapor permeable polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Thermal Resistance: R-value of 3.7, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
   2. Air Permeance: 0.04 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.57 psf.
   3. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   4. Basis of Design:
      a. Icynene-Lapolla; Classic Ultra Select: www.icynene.com/#sle.

2.03 ACCESSORIES

A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Patch damaged areas.

D. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

E. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 FIELD QUALITY CONTROL

A. Field inspections will be performed by an independent testing agency under provisions of Section 01 4000 - Quality Requirements.

B. Inspection will include verification of insulation thickness and density.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 2200
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Roof insulation, tapered deck, saddles and crickets for Thermoplastic Membrane Roof Systems.

B. Roof insulation for Steep Sloped Roof Systems.

1.02 RELATED SECTIONS

A. Related Work
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Section in Division 01 of these specifications.

B. Section 06 1000 – Rough Carpentry.

C. Section 07 5400 - Thermoplastic Membrane Roofing

D. Section 07 6113 – Standing Seam Sheet Metal Roofing.

E. Section 07 6200 – Sheet Metal Flashing and Trim.

F. Section 07 7200 – Roof Accessories.

1.03 REFERENCES

A. American Society of Testing Materials (ASTM) – Latest Edition
   1. C177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded - Hot - Plate Apparatus
   2. C209 Standard Test Methods for Cellulosic Fiber Insulating Board.
   3. C728 Standard Specification for Perlite Thermal Insulation Board.
   4. D41 Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
   5. D312 Standard Specification for Asphalt Used in Roofing.
   6. D1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
   7. D4601 Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.

B. National Roofing Contractor's Association (NRCA): Roofing and Waterproofing Manual, Fifth Edition.

C. FM Global Wind Uplift Requirements.

D. FM Global Loss Prevention Data Sheets 1-28 through 1-54, Latest Edition.

E. ASCE 7-(Latest Revision) - American Society Of Civil Engineers “Minimum Design Loads for Buildings and Other Structures.”

F. Underwriters Laboratory Building Materials Directory, Latest Edition.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's brochure, hard copy or electronic format product data sheets for each product.

B. Shop Drawings: Layout of roof plan showing insulation manufacturers attachment procedures complying with FM Global Wind Uplift Requirements, minimum I-90, or ASCE 7-(per governing building code) whichever is applicable, tapered insulation pattern, direction of slope, amount of slope, spot elevations indicating thickness at high and low points, and attachment enhancements at perimeters and corners as required by the applicable code shall be included.

C. Certification: Submit roof manufacturer's certification that insulation is acceptable as substrate for application of specified roof system.

D. Closeout Submittals.
   1. Submit under provisions of Section 01 7800 – Closeout Submittals.
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items.
      a. All mastics, glues, and adhesives.
      b. Thermal insulation (excluding fiberglass, foam, rubber).
      c. Sealant (interior use only).

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Classified by Underwriter's Laboratories as Class A roof covering.
   2. Follow local, state and federal regulations, safety standards, and codes.

B. Installation – Low Slope Roofing.
   1. Installation shall be in accordance with insulation manufacturer's current published application procedures, NRCA general recommendations, and FM Global, I-90 wind uplift criteria, or ASCE 7-(per governing building code) American Society Of Civil Engineers "Minimum Design Loads for Buildings and Other Structures" to include enhanced corner and perimeter attachment procedures as required by the code.
   2. Roof system and/or the insulation manufacturer's technical specifications shall be considered part of this Specification and shall be used as reference for specific application procedures.

C. Installation - Steep Slope Roofing
   1. Polyisocyanurate Rigid Insulation: Attach polyisocyanurate rigid insulation to metal decking as per the manufacturers written instructions in the required pattern to achieve a I-90 wind uplift rated assembly.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials in accordance with manufacturer's recommendations.

B. When Stored Outdoors.
   1. Tarp and shield insulation from moisture and ultraviolet rays.
   2. Elevate insulation above substrate 4" minimum.
   3. Secure insulation to resist high winds.
   4. Distribute insulation stored on roof deck to prevent concentrated loads that would impose excessive stress or strain on deck or structural members.
   5. Wet insulation or insulation that has been wet but which has dried may not be used.

1.07 SEQUENCING AND SCHEDULING

A. Substrate Acceptance: Roof system manufacturer's representative shall inspect roof deck and associated substrates and provide written acceptance of conditions.

B. Manufacturer's approved roofing contractor shall inspect and approve deck and substrates.

C. Plan roof layout with respect to roof deck slope to prevent rainwater drainage into completed roofing.

D. Do not install more insulation than can be covered with complete roof system in same day.

1.08 PROJECT CONDITIONS

A. Environmental Requirements.
   1. Apply roofing and insulation in dry weather.
   2. Do not proceed with roof construction during inclement weather or when precipitation is predicted 30% or more possibility.

3. Do not apply insulation over wet or moist deck or in foggy conditions.
4. Days with wind speeds of 30 mph or greater shall be considered "Bad Weather" days.

B. Emergency Equipment: Maintain on-site equipment and material necessary to apply emergency temporary seals in the event of sudden storms or inclement weather.

C. Costs for emergency roofing shall be borne by Contractor.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Polyisocyanurate Rigid Insulation.
1. The Atlas Roofing Corp.: www.atlasroofing.com
2. GAF Corp.: www.gaf.com.
3. Johns-Manville Corp.: www.jm.com
4. Rmax, Inc.: www.rmax.com
5. Carlisle SynTec: www.carlisle-syntec.com.
6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 INSULATION - THERMOPLASTIC MEMBRANE ROOFING SYSTEMS

A. Bottom Layer, Tapered Insulation, Crickets and Saddles - Polyisocyanurate Insulation Board shall be compatible with the membrane as recommended in thermoplastic sheet manufacturer's printed instructions. The roof insulation board shall be composed of a closed-cell polyiso core integrally laminated to heavy, black (non-asphaltic), glass fiber reinforced felt facers. The insulation facer shall exhibit a superior resistance to the potentially harmful effects of strong solvents like those used in adhered single-ply systems. The insulation shall have the following characteristics:
1. FM I-90 wind uplift classification.
2. Compressive strength - 20 psi.
3. Thickness and aged LTTR-value shall be a minimum total value of R-25.
4. Comply with Federal Specification HH-I-1972/GEN and HH-I-1972/2. ASTM C 1289, Type II, Class 1.
5. Comply with UL 1256.
6. Board shall be compatible for the specified roof applications.

B. Insulation Requirements:
1. Two layers of polyisocyanurate insulation; minimum total R-value of 25. First layer shall be mechanically fastened to the deck and the second layer shall me mopped in place.
2. Tapered Insulation: Tapered insulation, when not noted otherwise by the plans and/or details, shall be a minimum slope of 1/4” per foot.
3. Tapered crickets and saddles polyisocyanurate insulation ½ inch per foot as indicated on roof plans.

C. Cover Board
1. Gypsum/GlassFiber Roof Board, ASTM C473, min. thickness 1/2".(DensDeck Prime or Securock).R-Value of 0.56, mechanically attached.

2.03 INSULATION - STEEP SLOPED ROOFING SYSTEMS

A. Two (2) layers of closed-cell polyisocyanurate foam core manufactured using HCFC blowing agent and integrally laminated to heavy non-asphaltic fiber-reinforced felt facers each side.
1. FM I-90 wind uplift classification. Insulation shall be fastened as an independent system from the plywood.
2. Compressive strength - 20 psi.
3. Thickness and aged LTTR-value shall be a minimum total value of R-25.
4. Comply with Federal Specification HH-I-1972/GEN and HH-I-1972/2. ASTM C 1289, Type II, Class 1.
5. Comply with UL 1256.

6. Reference Section 06 1000 - Rough Carpentry and drawings for plywood top layer requirements.

2.04 INSULATION IDENTIFICATION

A. All insulation shall be labeled to display manufacturers R-value identification.

B. All insulation shall be installed to allow inspection of labels. Labels shall comply with section 102.5.1-2 of International energy code. Labels shall be permanently applied to material.

2.05 MECHANICAL FASTENERS

A. FM Global approved fasteners and plates.

B. For steel substrates.
1. Shall be minimum #12 diameter fastener, with two coatings of CR-10B meeting FM Global 4480 corrosion resistant requirements. All fasteners shall be approved by the respective manufacturers for type and length recommended by manufacturer for existing deck type.
2. Fasteners shall project into deck in accordance with manufacturer's requirements, but must penetrate deck ¾ - inch minimum.
3. Pre-Bid investigation of deck alignment, physical conditions, and depth are recommended.

PART 3 - EXECUTION

3.01 PROTECTION

A. Provide special protection from traffic on yet to be removed roofing.

3.02 INSTALLATION - THERMOPLASTIC MEMBRANE ROOFING SYSTEMS

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Mechanically Fastened Insulation: Install first layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

E. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof to meet ASCE 7-(per governing building code).

F. Offset joints in the insulation a minimum 6 inches in each direction.

G. Fully adhere subsequent layers of insulation and cover board to the mechanically attached layer. Offset joints in the insulation a minimum 6 inches in each direction.

3.03 INSTALLATION – STEEP SLOPED ROOFING SYSTEMS

A. Comply with system manufacturer’s written instructions for installing roof insulation.
1. Install two (2) layers of insulation under area of roofing in required thickness to achieve specified ‘R’ value. Install insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding ¼ inch with insulation.
2. Attach insulation to deck as recommended by the insulation manufacturer in the required pattern to meet ASCE 7-(per governing building code).
3. Use UL rated fasteners as recommended by the insulation manufacturer.
4. Apply no more insulation than can be covered in the same workday.
5. Insulation will be fastened as an independent system from the plywood.

3.04 ADJUSTING

A. Remove damaged or wet insulation and install acceptable new units before installation of roof system.

3.05 CLEANING

A. Remove debris and material wrappers from jobsite. Leave insulation clean and dry, ready to receive roofing membrane.

3.06 PROTECTION

A. Provide special protection from traffic on completed work.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls, and joints at base of wall.

1.02 RELATED REQUIREMENTS

A. Section 03 1119 - Insulating Concrete Forming

B. Section 04 2000 - Unit Masonry: Coordination of through wall flashing and masonry ties.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

D. Section 07 9200 - Joint Sealants: Sealing building expansion joints.

1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

1.04 REFERENCE STANDARDS

A. ASTM C297/C297M - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions; 2016.

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2017.

C. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2017.

D. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2017.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a.

G. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

H. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015.

I. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2019.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Preinstallation conference shall include the Architect, General Contractor, Manufacturer's Representative and Applicator. Agenda for meeting shall include but not be limited to the following:

1. Review of submittals.
2. Review of surface preparation, minimum curing period and installation procedures.
3. Review of special details and flashings.
4. Sequence of construction, responsibilities and schedule for subsequent operations.
5. Review of mock-up requirements.
6. Review of inspection, testing, protection and repair procedures.

B. Coordination of trades
1. The Architect, General Contractor and Applicator shall evaluate adjacent materials such as windows, doors, etc. for conformance to project details. Adjacent trades shall provide scaled shop drawings for review by the Architect.
2. The General Contractor shall make provision for installation of air seals between the primary air barrier and other wall components (penetrations, etc.) in order to maintain continuity of an air barrier system.
3. The Applicator shall provide protection of rough openings before installing windows, doors, and other penetrations through the wall.

1.06 SUBMITTALS

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

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

E. Air/water-resistive barrier membrane manufacturer shall provide an ICC-ES Evaluation Report confirming compliance with AC212 Acceptance Criteria for Water-Resistive Coatings used as Water-Resistive Barriers over Exterior Sheathing or Masonry or ICF.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.

1.07 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Evaluated Materials Program; 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.

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. Air barrier Subcontractor(s) shall be accredited minimum of three years at the time of bidding and during the complete installation period by the Air Barrier Association of America (ABAA).

C. Components used in this section shall be sourced from one manufacturer, including membrane, air barrier sealants, primers, mastics, self-adhered flashings and adhesives as listed and approved as an evaluated air barrier assembly by the Air Barrier Association of America.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

B. All pail goods shall bear the ABAA Evaluated Air Barrier label

C. Store roll materials on end in original packaging.

D. Keep all products stored at above 40°F. Apply to a substrate with a surface T°F of 40°F and rising. DO NOT ALLOW PRODUCT TO FREEZE.

E. Protect rolls from direct sunlight until ready for use.

F. Do not double stack pail goods.

1.09 MOCK-UP

A. Mockups: Before beginning installation of air/water-resistive barrier, provide air/water-resistive barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, roof tie-in and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
   1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air/water-resistive barrier before external insulation and cladding is installed.
   2. If Architect determines mockups do not comply with project requirements, reconstruct mockups and apply air/water-resistive barrier until mockups are approved.

B. Install air barrier materials in mock-up specified in Section 04 2000.

1.10 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

1.11 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturers 10 year material warranty.
   1. Ensure all manufacturers installation guidelines, specifications, details and warranty requirements are met.
   2. Warranty period shall be 10 years from date of substantial completion.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. General: Air/water-resistive barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. At wall cladding transitions, the air/water-resistive barrier shall form a continuous air barrier and shall make provision for water drainage, either by creation of an unobstructed drainage plane that extends across the cladding transition or by flashing to discharge to the exterior at the transition. Air barrier assemblies shall be capable of accommodating substrate movement and sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits, or interruption of the drainage plane.

B. Air Barrier shall be compatible with glass-mat faced gypsum, masonry and expanded polystyrene (ICF) wall systems.

C. The weather barrier assembly, including but not limited to, fluid applied air/water-resistive barrier membrane, sheathing fabric, transition membrane and flashing primer shall be obtained or approved as a single-source from the membrane manufacturer to ensure system compatibility and integrity.

D. Air Barrier:
   1. On outside surface of inside wythe of exterior masonry cavity walls use air barrier coating on wall surface and related thru-wall flashings, flashings for rough openings, windows, doors, base flashings and terminations to the roof.

2. On outside surface of sheathing of exterior walls use air barrier coating on wall surface and related thru-wall flashings, flashings for rough openings, windows, doors, base flashings and terminations to the roof.
3. On outside surface of ICF wall systems use air barrier coating on wall surface and related thru-wall flashings, flashings for rough openings, windows, doors, base flashings and terminations to the roof

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
   1. Air Barrier Coating:
      a. Assembly Performance: Provide a continuous air barrier in the form of an assembly tested in accordance with ASTM E2357
      b. Dry Film Thickness (DFT): Shall be as specified in the manufacturer written instructions for the substrate being applied and to produce a smooth pinhole-free surface and as required to achieve warranty.
      c. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
      d. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
      e. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to six months of weather exposure after application.
      f. Tensile bond: Minimum 15 psi or exceeds strength of substrate when tested in accordance with ASTM C297/C297M.
      g. Pull Adhesion: Minimum 110kPa (16psi) or substrate failure in accordance with ASTM D4541 for the substrate being applied.
      h. Multi-Story Wall Assembly Burn Test: For multi-story buildings where required by code, Air Barrier, as a component of a wall assembly, shall have passed a NFPA 285 complete wall fire test.
      i. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
      j. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
      k. VOC Content: 50 g per L or less.
      l. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
      m. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
      n. Manufacturers:
         1) BASF Corporation: www.master-builders-solutions.basf.us.
         2) Carlisle Coatings and Waterproofing, Inc: www.carlisleccw.com.
         3) Dow Corning Corporation: www.dowcorning.com.
         4) DuPont Building Innovations: www.dupont.com.
         5) GE Silicones: www.siliconeforbuilding.com.
         6) Henry Company: www.henry.com
         7) Pecora Corporation: www.pecora.com.
         8) PROSOCO, Inc: www.prosoco.com.
         9) STS Coatings, Inc.: www.stscoatings.com.
         10) Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com
         11) W.R. Meadows, Inc: www.wrmeadows.com.
         12) Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Sealants, Flashings, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Liquid Flashing: One part, fast curing, non-sag, elastomeric, gun grade, trowelable liquid flashing.

C. Transition Membrane, Seam and Window Flashing: Peel and stick flashing membrane film bonded to sealant.
   1. Thickness: 40 mil, 0.040 inch overall.
   2. Roll Width: 4, 6, 8 inch, as required for application.
   3. Coordinate installation with the Masonry Contractor and other provisions as required in Section 04 2000 - Unit Masonry.

D. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

B. Walls
   1. Substrates
      a. Wall sheathing must be securely fastened per applicable building code and sheathing manufacturer's requirements.
      b. Examine surfaces to receive air/water resistive barrier and verify that substrate and adjacent materials are dry, clean, sound, and free of releasing agents, paint, or other residue or coatings. Verify substrate is flat, free of fins or planar irregularities greater than 1/4" in 10'. Verify that no excess mortar exists on masonry ties, shelf angles and other obstructions.
      c. Verify that concrete is visibly dry and free of moisture.
      d. Verify that masonry joints are struck flush and completely filled with mortar.
   2. Flashings
      a. All flashings must be installed in accordance with specific design and building code requirements. Where appropriate, end-dams must be provided.
      b. Openings must be flashed prior to window/door, HVAC, etc. installation. Windows and openings shall be flashed according to design and building code requirements.
      c. Individual windows that are ganged to make multiple units require continuous head flashing and the joints between the units must be fully sealed.
   3. Kick-out flashing
      a. Kick-out flashing must be installed leak-proof and angled (min 100°) to allow for proper drainage and water diversion.
   4. Air Seals
      a. Install between the primary air/weather barrier and other wall components (penetrations, etc.) in order to maintain continuity of the air barrier system

C. Report all unsatisfactory conditions to the General Contractor. Application of fluid-applied air/water-resistive barrier shall not proceed until all unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: No additives are permitted unless specified in product mixing instructions. Close containers when not in use. Prepare in a container that is clean and free of foreign substances. Do not use a container which has contained or been cleaned with a petroleum-based product. Clean tools and equipment with water immediately after use. Dried material can only be removed mechanically.

B. Sheathing joints or joints in ICF less than 1/2" shall be treated with liquid flashing as reccommended by the manufacturer.

C. Sheathing joints or joints in ICF over 1/2" shall be treated with transition material or as reccommended by the manufacturer.

D. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

E. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

D. Coatings:
   1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
   2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
   3. Use flashing to seal to adjacent construction and to bridge joints.

E. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing extending a minimum 3 inches onto vertical wall and into rough opening with transition membrane.
   2. Hollow Metal Door Frames: Seal door frame to wall surface with transition membrane.
   3. Perimeter wood nailers at wall openings: Cover all exposed surfaces of wood nailers with transition membrane. Extend membrane over ICF, sheathing, masonry and metal framing.
   4. Aluminum frames: Seal frames to the wall surface with transition membrane.
   5. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Do not cover installed weather barriers until required inspections have been completed.

C. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

D. Take digital photographs of each portion of the installation prior to covering up.

3.05 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. Complete manufactured metal panel systems for walls and soffits, including related flashings, accessory components, and attachment of metal panel systems, including all required subgirt assemblies for walls and soffits to approved substrates.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 06 1000 - Rough Carpentry

C. Section 07 2100 - Thermal Insulation.

D. Section 07 2500 - Weather Barriers: Weather barrier under wall panels.

1.03 REFERENCE STANDARDS

A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate allowable system pressures, dimensions, layout, joints, construction details, methods of anchorage.

C. Samples: Submit two samples of wall panel and soffit panel, 12 inch by width of panel in size illustrating finish color, sheen, and texture.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum three years of documented experience.

1.06 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.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Furnish a written warranty signed by the Panel Applicator for a two (2) year period from the date of substantial completion of the building guaranteeing materials and workmanship for the preformed metal panel system, flashings and penetrations.

C. Furnish manufacturer’s standard 20-year written finish warranty stating that architectural fluorocarbon finish will be:

1. Free from fading or color change in excess of 5 NBS units as measured per ASTM D2244;

2. Will not chalk in excess of a numerical rating of 7 when measured in accordance with standard procedures specified in ASTM D4214;
3. Will not peel, crack, chip or delaminate

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
1. Berridge Manufacturing Company: www.berridge.com.
2. Centria: www.centria.com.
3. Fabral Wall and Roof Systems: www.fabral.com
4. MBCI: www.mbci.com.
5. McElroy Metal: www.mcelroymetal.com.
6. Petersen Aluminum Corporation: www.pac-clad.com.

2.02 MANUFACTURED METAL PANELS

A. Panel System: Factory fabricated prefinished metal panel system, site assembled.
1. Provide exterior panels, soffit panels, and subgirt framing assembly.
2. Design Loads: In addition to the self-weight of the panel systems, metal panel systems shall be designed to resist the maximum of the following: Wind Pressures indicated on the Structural Drawings, or the wind pressures required by the version of ASCE 7 referenced in the version of the International Building Code (IBC) for this project.
3. Anchorage: Provide anchorage into approved substrate for complete metal panel system capable of resisting all required loads and pressures (i.e. gravity and wind). (Note: For ICF wall assemblies, It shall not be permitted to rely on ICF unit web components (e.g. plastic flanges buried in the insulating formwork) for anchorage of metal panel systems for walls)
4. 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.
5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
7. Corners: Factory-fabricated in one continuous piece with minimum 2 inch returns.
8. Provide continuity of air barrier and vapor retarder seal at building enclosure elements in accordance with materials specified in Section 07 2500.
9. Custom Fluoropolymer Coating System: Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as scheduled in Section 01 6210 - Schedule of Materials and Colors.

B. Exterior Wall Panels:
1. Profile: Vertical; Centria; Profile CS-613, CS-620 and CS-600 Series. See drawings for locations.
2. Material: Precoated steel sheet, 22 gage, 0.0299 inch minimum thickness.
3. Panel Width: 16 inches.
4. Products/Color: As scheduled in Section 01 6210 - Schedule of Materials and Colors.

C. Soffit Panels:
1. Profile: Centria; IW-10A.
2. Material: Precoated steel sheet, 22 gage, 0.0299 inch minimum thickness.
3. Panel Width: 12 inches.
4. Perforated Metal Soffit Panels: Where noted on the drawings as vented soffits panels, panel shall have perforations providing 12% net free vent area.

5. Color: As scheduled in Section 01 6210 - Schedule of Materials and Colors.

D. Subgirt Framing Assembly:
   1. Profile as indicated; to attach panel system to approved substrate in a manner that is capable of resisting all required loads and pressures (i.e. gravity and wind). (Note: For ICF wall assemblies, It shall not be permitted to rely on ICF unit web components (e.g. plastic flanges buried in the insulating formwork) for anchorage of metal panel systems for walls)"

E. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

F. Expansion Joints: Same material, thickness and finish as exterior sheets; 22 gage, 0.0299 inch thick; manufacturer's standard brake formed type, of profile to suit system.

G. Trim, Closure Pieces, Caps, Flashings, Facias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

H. Anchors: Galvanized steel.

2.03 MATERIALS

A. Precoated Steel Sheet: Aluminum-zinc alloy-coated steel sheet, ASTM A792/A792M, Commercial Steel (CS)) or Forming Steel (FS), with AZ50/AZM150 coating; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 ACCESSORIES

A. Concealed Sealants: Non-curing butyl sealant or tape sealant.

B. Fasteners: Manufacturer's standard type to suit application; steel, hot dip galvanized.

C. Field Touch-up Paint: As recommended by panel manufacturer.

D. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that weather barrier has been installed over substrate completely and correctly.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated.

3.03 INSTALLATION

A. Install panels on walls and soffits 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 installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Provide expansion and control joints where indicated or as recommended by the manfacturer.

F. Use concealed fasteners unless otherwise approved by Architect.

G. Where metal panels are installed on the ICF Wall System, install exterior gyp sheathing, weather barrier and furring channels over the ICF System to provide compliance with NFPA 285

H. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

C. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

END OF SECTION

SECTION 07 5400
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered system with thermoplastic PVC roofing membrane.

B. Flashings.

C. Roofing stack boots, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers.

B. Section 07 2200 - Roof and Deck Insulation

C. Section 07 7200 - Roof Accessories: Roof-mounted units; prefabricated curbs.

1.03 REFERENCE STANDARDS

A. ASTM D4434/D4434M - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing; 2015.

B. NRCA (RM) - The NRCA Roofing Manual; 2018.

C. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene with all related trades before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

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

B. Product Data: Provide data indicating membrane materials, sealants, adhesives, flashing materials, fasteners, and other related materials.

C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.

D. Manufacturer's Installation Instructions: Indicate membrane seaming precautions, finish coating installation, special procedures, and perimeter conditions requiring special attention.

E. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

F. Warranty Sample:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's certification that installation complies with warranty conditions for waterproof membrane.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with at least five years of documented experience and approved by manufacturer.

C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

D. Roof System shall meet minimum requirements in accordance of ASCE 7 per code jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

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.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 100 degrees F.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Special Warranty: Manufacturer's standard or customized form, without monetary limitation,(“NDL”) in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 20 years from date of Substantial Completion.
   2. Contractor’s Workmanship Warranty: Five (5) years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermoplastic Polyvinyl Chloride (PVC) Membrane Roofing Materials:
   1. Carlisle Roofing Systems, Inc: www.carlisle-syntec.com/sle.
   2. GAF;: www.gaf.com/sle.
   3. Johns Manville: www.jm.com.
   4. Sika Corporation Roofing; Sarnafil PVC: usa.sarnafil.sika.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation:
   1. Reference Section 07 2200 - Roof and Deck Insulation

2.02 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.
      b. Provide 0.080 inch, (80 mil) minimum at kitchens or where noted on the plan.
   2. Sheet Width: Factory fabricated into largest sheets possible.
   3. Solar Reflectance: 0.75, minimum, initial, and 0.65, minimum, 3-year, certified by Cool Roof Rating Council.
   4. Thermal Emissivity: 0.80, minimum, initial, and 0.79, minimum, 3-year, certified by Cool Roof Rating Council.
   5. Color: White.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Flexible Flashing Material: Same material as membrane.

2.03 DECK SHEATHING AND COVER BOARDS

A. Reference Section 07 2200 - Roof and Deck Insulation

2.04 INSULATION

A. Reference Section 07 2200 - Roof and Deck Insulation

2.05 ACCESSORIES

A. Roofing Expansion Joint Flashing: Sheet metal, as specified in Section 07 6200.

B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

C. Membrane Adhesive: Low VOC as recommended by membrane manufacturer.

D. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

E. Thinners and Cleaners: Low VOC as recommended by adhesive manufacturer, compatible with membrane.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

G. PVC Coated Metal, white.

H. Strip Reglet Devices: Galvanized steel, maximum possible lengths per location, with attachment flanges.

I. Sealants: As recommended by membrane manufacturer.

J. Roof Drains:
   1. Primary Roof Drains and secondary overflow scuppers or roof drains as specified shall be as specified in Division 22 – Plumbing Piping in sizes as indicated on the plumbing drawings. The furnishing of the roof drains will be the responsibility of the Plumbing Contractor and specified in Division 22.

K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

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: 18 by 18 inch.
   3. Provide around all mechanical and HVAC equipment and other locations shown on the roof plan.

M. Termination Bars: Pre-drilled, stainless steel or aluminum, approximately 1" wide X 1/8" thick, with anchors.

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.

D. Verify deck surfaces are dry and free of snow or ice and/or water, dew, etc.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and nailing strips and reglets are in place.

3.02 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 unsuitable weather.

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.

3.03 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully adhere membrane roofing over the installed insulation per membrane roof system manufacturer’s written instructions. Comply with ASTM D 5036 for sheet install.

D. Bonding Adhesive: Apply adhesive to the substrate and the underside of the membrane at the rate required by the manufacturer. Allow to partially dry, ”tacky”, before rolling in the membrane. Do not apply to splice areas. Broom membrane into adhesive eliminating wrinkles.

E. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
   2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
   4. Test lap edges with a probe to verify seam weld continuity. Apply lap sealant to seal cut edges of the field sheet membrane.
   5. Random seam weld test samples will be taken.

F. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to reglets.
   3. Secure flashing to nailing strips at 4 inches on center.
   4. Insert flashing into reglets and secure.

G. At edge stops, extend membrane under edge stop and to the outside face of the wall.

H. Around roof penetrations, seal flanges and flashings with flexible flashing.

I. Install roofing expansion joints where indicated. Make joints watertight.
   1. Install prefabricated joint components in accordance with manufacturer's instructions.

J. Coordinate installation of roof drains and sumps and related flashings.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field quality control and inspection.

B. Require site attendance of roofing and insulation material manufacturers minimum of 3 times during installation of the Work.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

D. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

3.05 CLEANING

A. Remove all markings from finished surfaces.

B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

C. Contractor shall power wash the roof upon completion to remove all construction related dirt and debris.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.06 PROTECTION

A. Protect installed roofing and flashings from construction operations and trades.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6113
STANDING SEAM SHEET METAL ROOFING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work Included:The contractor shall provide all labor, material, and administration and other items to provide a complete pre-finished engineered 180 degree standing seam metal roof system complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement and exposure to weather without failure or infiltration of water into the building interior.

B. Coordinate pre-finished engineered standing seam metal roof system with roofing substructure work.

C. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 SECTION INCLUDES

A. Preformed and pre-finished manufacturer's fully engineered standing seam metal roof system with continuous interlocking field formed seams, concealed clips and fastening devices.

B. Color coordinated ridge, hip, valley, gable, eave, corner, rake, headwall, counter flashings and miscellaneous flashings and attaching devices.

C. Provide concealed clips, fasteners, closures and factory and field applied sealants as necessary to meet design criteria and ensure a weather-tight installation.

D. Specified underlayment.

1.03 RELATED SECTIONS

A. Section 05 1200 - Structural Steel Framing

B. Section 05 3123 – Steel Roof Decking

C. Section 06 1000 – Rough Carpentry

D. Section 07 7200 – Roof Accessories

E. Section 07 2200 – Roof and Deck Insulation

1.04 REFERENCES

A. ASCE 7-(Latest Revision) - American Society of Civil Engineers "Minimum Design Loads for Buildings and Other Structures"

1.05 SYSTEM DESCRIPTION

A. DESIGN REQUIREMENTS

1. The structural standing seam metal roof system, including: panels, flashings, attachment clips and attachment screws shall be designed by the manufacturer of the standing seam metal roof system per ASCE-7 (Latest Revision) to meet the local building code as defined by the design professional. Refer to the drawings for applicable building codes. The design criteria shall include the following:
    a. Listing of applicable loads.
    b. Listing of the building importance factor (life safety factor).
    c. Design wind speed.
    d. Building exposure factor.
    e. Other necessary criteria.

2. The manufacturer of the engineered standing seam metal roof system shall provide an engineered analysis of the roofing system, sealed by a registered Structural Engineer employed by the manufacturer and licensed in the State of Texas, verifying that the product and attachment methods will resist wind pressures imposed upon it pursuant to the applicable building codes and that the roofing system fully complies with all specified requirements.
3. Provide UL90 rated roofing panels that have been tested in accordance with UL 580 (Flat Panel) criteria.
4. Provide preformed factory panel system that has been pre-tested and certified by manufacturer to comply with specified requirements under installed conditions.
5. When possible, provide one-piece, single continuous length roof panel from ridge to eave. When panel length exceeds lengths required by manufacturing constraints, field roll-formed panels may be used when approved by the Architect.
    a. When field roll-formed panels are approved by the Architect, the following criteria shall be met:
        1) The panel forming machine shall be U.L. certified capable of producing metal roof panels in compliance with these written specifications.
        2) The panel forming machine shall be owned by the panel manufacturer and shall be operated by factory authorized personnel.
6. Provide continuous interlocking field formed standing seam that inherently increases load span capability, stiffness and flexural stress handling capacity.
7. Provide continuous factory installed hot-melt butyl sealant within the confines of the female flange.
8. Provide preformed factory panel that has been tested and approved for a Class 4 Impact (Hail) resistance rating per UL 2218. Listing shall be present on the UL website (Refer to Underwriters Laboratories website at www.ul.com/)

B. ENGINEERING REQUIREMENTS
1. Panel properties shall be determined in accordance with latest edition of American Iron and Steel Institute's "Cold Formed Steel Design Manual," using "effective width" concepts.
2. Wind uplift design for roof assemblies shall be calculated by the structural standing seam metal roofing system manufacturer per ASTM E 1592. Calculations shall include establishment of ultimate and allowable roof system uplift capacities for both the "field" and "areas of discontinuity".
3. Provide confirmation of positive and negative values buckling moments and uplift capacity determined by full-scale tests.

C. SUBSTRATE CRITERIA
1. Standing Seam Metal Roofing: Engineered standing seam metal roof system shall be installed over the specified self-adhering underlayment membrane on a plywood substrate over rigid insulation over metal decking that is capable of withstanding UL Class 90 loading as per the UL 580 (Flat Panel) requirements applied at 90 degrees to surface and spaced as shown on the approved shop drawings.
2. Waterproof Membrane Underlayment: Apply self-adhering waterproof membrane under entire roof surface per manufacturers written instructions.

D. ENVIRONMENTAL REQUIREMENTS: Actual independent laboratory certified test results must be submitted.
1. Resistance to air infiltration:
    a. .004 cfm per linear foot of joint when tested in accordance with ASTM E 1680 at static test pressure differential of 12.00 psf.
        1) Resistance to water infiltration:
            (a) No leakage through panel joints when tested in accordance with ASTM E 1646 at static test pressure differential of 20.00 psf.
        2) Resistance to air infiltration:

(a) .027 cfm per linear foot of joint when tested in accordance with ASTM E 283 at static test pressure differential of 6.24 psf.

3) Resistance to water infiltration:
   (a) No leakage through panel joints when tested in accordance with ASTM E 331 at static test pressure differential of 6.24 psf.

1.06 SUBMITTALS

A. Shop drawings, product data, and samples under provisions of Section 01 3000 – Administrative Requirements.

B. PRODUCT DATA: Submit manufacturer's specifications, engineered detail drawings, and installation instructions.

C. SHOP DRAWINGS
   1. Submit approval / design drawings produced by the panel system manufacturer indicating thickness and dimensions of parts, fastenings and anchoring methods, details and locations of seams, transitions and other provisions necessary for thermal expansion and contraction.
   2. Indicate roof terminations, clearly showing flashings and change of direction caps.
   3. Clearly indicate locations of field and factory applied sealant.
   4. Show locations, spacing patterns and types of hold-down clips and fasteners.
   5. Provide 24" x 36" blue line or Auto CAD produced drawings provided by the engineered standing seam metal roof system manufacturer showing complete roof plan, roof panel layout, and cross section details for every individual condition of the entire roof system.

D. SAMPLES
   1. Submit two samples, 12" long x full width of panel, showing proposed metal gauge and seam profile.
   2. Submit color samples on metal for Architect's verification based on color schedule. Upon selection of approved color, submit 12"x12" painted metal sample for approval. Paper samples not acceptable.

E. TEST REPORTS
   1. Submit certified test reports prepared by (UL) Underwriters Laboratories, Inc. indicating wind uplift rating of proposed roof system.
   2. Submit verification the panel system meets the Environmental Conditions for the indicated test pressures and performance listed for Air and Water Infiltration.

F. ENGINEERED DESIGN CALCULATIONS
   1. Submit panel system manufacturer's design calculations verifying the panel system meets the specified building code as defined in Section 1.4 System Description, A. Design Requirements listed above.
   2. Design calculations shall be sealed by a registered Structural Engineer employed by the manufacturer of the panel system and licensed in the State of Texas.

G. CERTIFICATION
   1. Submit manufacturer's certification that materials and finishes meet specified requirements.
   2. Submit written verification of panel Applicator's factory installation training performed by the engineered standing seam metal roof system manufacturer and a copy of the Panel Applicator's "Authorized Applicator" certificate.

H. CLOSEOUT SUBMITTALS
   1. Submit under provisions of Section 01 7800 - Closeout Submittals.
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
      a. All mastics, glues, and adhesives

b. Thermal insulation (excluding fiberglass, foam, rubber)

1.07 QUALITY ASSURANCE

A. MANUFACTURER'S QUALIFICATIONS
1. Minimum twenty (20) years experience in the fabrication of engineered standing seam metal roof systems on projects of similar size and scope. Upon request, submit a minimum of five (5) project references for Architect's review. List project address, date of installation, Architects and Owner's name and telephone numbers.
2. No other manufacturer of engineered standing seam metal roof systems will be accepted without prior written approval of the Architect and based upon the manufacturer verifying the product can meet or exceed all performance criteria listed in these specifications.
3. Requests to be listed as an approved manufacturer must be submitted in writing a minimum ten (10) days prior to bid date accompanied by product literature, technical information, sealed engineer's calculations verifying conformance, and a product sample. Approved manufacturers will only be set forth in a written and issued addendum.
4. No substitutions will be permitted after the bid date.

B. APPLICATOR QUALIFICATIONS
1. Panel Applicator must have a minimum of five (5) years experience in the application of engineered standing seam metal roof systems.
2. Panel Applicator must be factory trained by the metal roof system manufacturer prior to the bid date in order to obtain a contract for installation.
3. Use an adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this Section.
4. Use equipment of adequate size, capacity and numbers to accomplish the work of this Section in a timely manner.
5. Upon request, submit a minimum of five (5) successfully completed projects of similar size and scope. List project address, date of installation, Architect and Owner's name and telephone numbers.
6. Single Source Responsibility: Provide all items of engineered standing seam metal roof system work specified herein by a single roofing contractor to provide undivided responsibility.

C. REGULATORY REQUIREMENTS
1. Comply with all requirements of applicable building codes and other agencies having jurisdiction for positive and negative design loads of engineered standing seam metal roof systems.
2. Engineered standing seam metal roof system shall be previously tested and passed for UL-90 wind uplift, class UL 580 (Flat Panel) procedure. Products must be listed on the Underwriters Laboratories website at: http://www.ul.com/

1.08 DELIVERY, STORAGE AND HANDLING

A. DELIVERY
1. Delivery of material shall be made only after suitable facilities for its storage and protection area available on the site.
2. Protect products and accessories from damage and discoloration during transit and at project site.
3. Upon receipt of pre-finished preformed metal panels, flat sheets, flashings and panel accessories, Panel Applicator shall examine each container for damage and for completeness of the consignment.

B. STORAGE

1. Store materials out of the weather in a clean, dry place. One end of each container should be slightly elevated and covered with a loose weatherproof covering to prevent condensation.
2. Panels and/or flashings with strippable film must not be stored in areas exposed to direct sunlight. Remove strippable film before installation.
3. Care should be taken to prevent contact with any substance that may cause discoloration.
4. Store materials to provide ventilation and prevent bending, abrasion or twisting.
5. Do not overload roof structure with stored materials. Do not permit material storage or traffic on completed roof surfaces.

C. HANDLING
1. Care should be taken to avoid gouging, scratching or denting.
2. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
3. Protect installed products from damage caused by foreign objects and construction until completion of project.
4. Comply with pertinent provisions of Supplementary General Conditions.

1.09 WARRANTY

A. Furnish manufacturer's standard 20-year written finish warranty stating that architectural fluorocarbon finish will be:
1. Free from fading or color change in excess of 5 NBS units as measured per ASTM 2244-68;
2. Will not chalk in excess of a numerical rating of 7 when measured in accordance with standard procedures specified in ASTM D 659-74;
3. Will not peel, crack, chip or delaminated.

B. Furnish a written warranty signed by the Panel Applicator for a five (5) year period from the date of substantial completion of the building guaranteeing materials and workmanship for weathertightness of the roofing system, flashings, penetrations and against all leaks.

C. Special Weathertight Warranty: Furnish manufacturer's 20-year, full system, non-prorated, no dollar limit weathertight warranty to be jointly signed by the manufacturer and Panel Applicator. Warranty shall include full cost of repair and replacement.

D. Protect products and accessories from damage and discoloration during transit and at project site. Store sheets and components in dry storage area to prevent condensation.

E. Do not overload roof structure with stored materials. Do not permit material storage or traffic on completed roof surfaces.

1.10 PRE-INSTALLATION CONFERENCE

A. Convene prior to commencing work of this Section and Referenced Sections.

B. Attendants: Architectural Observer, Owner's Representative, Contractor, Roof Consultant, Panel Applicator, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, Roofing system manufacturer's technical representative.

C. Record discussion, decisions and agreements reached and furnish a copy to each attendant.

D. Review installation procedures and coordination required with related Work.

E. Tour representative areas of roofing substrates, inspect and discuss condition of substrates, roof drains, curbs, penetrations, wood nailers and other preparatory work performed by other trades.

F. Review structural loading limitations of steel deck and inspect deck for loss of flatness and as required for mechanical fastening.

G. Review roofing system requirements (approved manufacturer's shop drawings, specifications and other contract documents.

H. Review required submittals.

I. Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to avoid delays.

J. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing.

K. Contractor to document the meeting with written minutes and copy all in attendance.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. ENGINEERED STANDING SEAM METAL ROOF SYSTEM: Prior approval is required per Supplementary General Conditions, and alternate manufacturers must be approved per written and issued addendum a minimum of ten (10) days prior to the bid date.
   1. Architectural Building Components/McElroy; Maxima ADV
   2. Berridge Manufacturing Company; Double-Lock Zee-Lock Panel
   3. Fabral Wall and Roof Systems; Double Locked PowerSeam
   4. MBCI; "Superlok 216"
   5. Peterson Aluminum Corp.; Tite-Loc Plus
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. SELF-ADHERING UNDERLAYMENT:
   1. Carlisle "WIP300HT"
   2. Tamko; "TW Metal & Tile"
   3. GCP Applied Technologies; "Ultra"
   4. GAF; STORMGARD
   5. Substitutions: See Section 01 6000 - Product Requirements.

C. INSULATION: Reference Section 07 2200 – Roof and Deck Insulation of these specifications for Roof and Deck Insulation.

D. PLYWOOD SUBSTRATE: Reference Section 06 1000 – Rough Carpentry of these specifications for requirements regarding plywood substrate.

E. **SUBSTITUTIONS**
   1. Requests to be listed as an approved manufacturer must be submitted in writing a minimum ten (10) days prior to bid date accompanied by product literature, technical information, sealed engineer's calculations verifying conformance, and a product sample. Approved manufacturers will only be set forth in a written and issued addendum.
   2. Alternate manufacturers must fully comply with all specified requirements.

2.02 MATERIALS

A. PANELS
   1. Pre-finished Galvalume sheet, ASTM AZ50 made of 55% aluminum, 1.6% silicon and the balance zinc as described in ASTM specification A792.
   2. Panels shall be 24 gauge with Kynar 500 Finish.
   3. Factory fabricated panel with integral continuous overlapping seams suitable for continuous locking or crimping by mechanical means during installation. On-site or field roll formed panel profiles will not be acceptable except as approved by the Architect when panel lengths exceed manufacturing constraints.
   4. Seam Size:
      a. Rib: 2" high, 180 degree seam.
         1) Provide factory installed, high grade, hot-melt elastomeric sealant, within the confines of female seam flange, on bottom edge of female seam flange, designed to seal against adjacent male panel leg.
   5. Panel: Striated

B. CLIP/FASTENER ASSEMBLIES
   1. Typical clip
      a. UL 90 requirements
         1) UL-90 Fasteners: as per approved manufacturer's engineered shop drawings.
         2) UL Rated Clip: Sliding 22 gauge galvanized steel hook in combination with a double fastened 16 gauge galvanized steel base, both at Fy (MIN) = 33 ksi. Clip hook shall have a shop installed hot-melt butyl sealant for continuity of seal at clip locations.
      b. Typical Low Clip:
         1) Requirements:
            (a) UL-90 Fasteners: as per approved manufacturer's engineered shop drawings.
            (b) Sliding 26 gauge at Fy=40ksi (MIN) galvanized steel hook in combination with a double fastener 18 gauge at Fy = 50 ksi (MIN) galvanized steel base. Clip hook shall have a shop installed hot-melt butyl sealant for continuity of seal at clip locations.
      c. Standard Fasteners: Same as UL 90 fasteners specified above.

C. ACCESSORIES
   1. Provide manufacturer's standard accessories and other items essential to completeness of standing seam roof installation.
   2. Roof Jacks: Manufacturer's standard EPDM with an aluminum sealing base ring; for openings twelve (12) inches or smaller.
   3. Roof Curbs: fabricated to the specifications of the engineered standing seam metal roof manufacturer, thereby assuring compatibility with the roof construction framing and covering. Roof curbs shall be of sufficient size and design to coordinate with requirements for support of heat and smoke vents specified in another Division 7 Section. Roof curb flashing and framing shall provide for the expected expansion and contraction of the engineered standing seam metal roofing system.
   4. Gutters and downspouts will be fabricated per specification Section 07 6113 – Standing Seam Sheet Metal Roofing.

D. FIELD SEALANTS
   1. Color coordinated primerless urethane as recommended and engineered by panel manufacturer.
   2. Do not use sealants containing asphalt.

E. SELF-ADHERING UNDERLAYMENT MEMBRANE
   1. Flexible, self-adhering rubberized asphalt sheet membrane with a polymeric film on the surface and a removable silicone-treated release sheet on the adhesive side.
   2. Self-Adhering underlayment membrane shall be rated for high temperature resistance up to 250 degrees F.
   3. Self-Adhering underlayment membrane shall have a maximum permeance rating of 0.05 perms.
   4. Minimum thickness shall be 30 mils.

F. RIGID INSULATION: Reference Section 07 2200 – Roof and Deck Insulation of these specifications for Roof and Deck Insulation for attachment procedures.

G. PLYWOOD SUBSTRATE Reference Section 06 1000 – Rough Carpentry of these specifications for requirements regarding plywood substrate.

2.03 FABRICATION

A. Panels
   1. Provide factory formed panel widths of 16", with a 2" high standing seam.

2. On-site or field roll formed panels are not acceptable except as approved by the Architect when panel lengths exceed manufacturing constraints..
3. Provide panels in full length from ridge to eave.
4. Roof panels shall have flush horizontal and vertical surfaces to facilitate sealing at terminations. Panel configurations that create voids and require supplemental closure devices are acceptable.
5. Panel seams shall interlock entire length of seam.
6. Design standing seam to lock up and resist joint disengagement during design wind uplift conditions as calculated to comply with local building codes and design uplift criteria.
7. Provide factory sealant within confines on trailing edge of female seam leg to aid in resistance of leaks and provide panel-to-panel seal while allowing expansion and contraction movement, and the seams shall be continuously locked or crimped together by mechanical means during installation.

B. Clips
1. Provide UL listed clip designed to allow panels to thermally expand and contract and provide a minimum of ± 1 inch of thermal movement. Clip shall incorporate a self-centering feature to allow a minimum of 1" of movement in both directions along panel length.
2. Clip shall be designed to meet positive and negative pressures as calculated per local building code and as engineered by the roofing system manufacturer.

C. Engineer panels to use concealed anchors that permit expansion and contraction, except at end laps, ridges and hips.

D. Trim/Flashings
1. Pre-finished sheet metal designed by the manufacturer in the same gauge, material and finish as the structural standing seam metal roofing system.
2. Locations, design, sealing and fastening methods as per the manufacturer’s approved engineered shop drawings.

2.04 FINISH

A. Fluorocarbon Coating:
1. Full strength 70% Kynar 500® coating baked coil-coated finish.
2. Dry-film thickness of 1.0 mil including primer.
3. 0.3 mil baked on epoxy primer.
4. Color: As selected by Architect from manufacturer’s standard finishes.

PART 3 - EXECUTION

3.01 CONNECTING WORK

A. General: Provide metal roofing panels of full length from eave to ridge when possible.
1. Field cutting by torch is not permitted.
2. Do not apply roofing during inclement weather.
3. Do not apply roofing to damp or frozen deck surface.
4. Do not expose materials vulnerable to water, wind or sun damage in quantities greater than can be weatherproofed during the same day.
5. Rigidly fasten ridge of metal roof panels and allow free eave movement due to thermal expansion and contraction per the approved shop drawings.
6. Install screws fasteners with power tools having controlled torque.
7. Locate and space fasteners per the approved shop drawings in true vertical and horizontal alignment. Exposed fasteners in roofing panels will not be permitted.
8. Install Ridge, Hip and penetration flashings per the approved shop drawings as work progresses. Position roof jacks only in the flat of the panel; do not alter standing seam ribs.

B. The Panel Applicator shall examine all surfaces on which their work is to be applied, and shall notify the architect in writing if not suitable to receive their work. Work on any surface shall constitute acceptance of this surface by the Panel Applicator. After beginning installation, install approximately 500 square feet of panels for Architect's approval, before proceeding with substantial work.

C. PLYWOOD SUBSTRATE AND NAILERS: Reference Section 06 1000 - Rough Carpentry of these specifications for requirements regarding plywood substrate.

3.02 FIELD MEASUREMENTS

A. Panel Applicator must take field measurements to verify or supplement dimensions indicated prior to fabrication of any materials. Where field measurements cannot be made without delaying the work, either establish opening dimensions and proceed with fabricating panels without field measurements or allow for trimming panel units.

3.03 RIGID BOARD INSULATION INSTALLATION

A. Reference Section 07 2200 – Roof and Deck Insulation of these specifications for Roof and Deck Insulation attachment procedures.

3.04 PLYWOOD SUBSTRATE INSTALLATION

A. Reference Section 06 1000 – Rough Carpentry of these specifications for requirements regarding plywood substrate.

3.05 WATERPROOF UNDERLAYMENT INSTALLATION

A. Apply waterproof underlayment over entire roof surface perpendicular to metal roofing panels and over parapet blocking per manufacturer's written instructions, but with not less than six (6) inch laps at vertical (side) laps and four (4) inch horizontal (top and bottom) laps.

B. Install an extra layer of minimum 36" wide waterproof membrane down all valley, rake wall and gable conditions, using a minimum six (6) inch horizontal (top and bottom) lap.

3.06 METAL ROOFING INSTALLATION

A. Workmanship shall conform to standards set forth in the architectural sheet metal manual as published by SMACNA.

B. Comply with manufacturer's instructions for assembly, installation, and erection in order to achieve a weather tight installation. Install in accordance with approved shop drawings. Roofing system shall be inspected by manufacturer's technical representative. Contractor shall make all repairs necessary to ensure warranty compliance.
   1. Anchor securely in place using clips and fasteners spaced in accordance with manufacturer's recommendations for design wind load criteria.
   2. Panels should be installed in such a manner that horizontal lines are true and level and vertical lines are plumb.
   3. Field apply sealant to penetrations, transitions, and other locations as necessary (not inside the standing seam ribs) for an airtight, waterproof installation.
   4. Remove all protective film, if any, before installation of materials.

C. Dissimilar Metals:
   1. Do not allow panels or flashings to come into contact with dissimilar metals.

3.07 CLEAN UP

A. Clean exposed surfaces of work promptly after completion of installation.

B. Only minor scratches and abrasions will be allowed to be touched up. Any other damaged material shall be replaced.

C. Leave work areas clean, free from grease, dirt, finger marks and stains.

D. Remove scrap and debris from surrounding grounds and work areas daily.

3.08 PROTECTION

A. Metal Roofing: Protect work as required to ensure that engineered standing seam metal roof system will be without damage at time of final completion.

B. Plywood Sheathing: Cover plywood sheathing as soon as possible with specified underlayment for protection against excessive moisture prior to roofing application.

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, and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

E. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

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

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Submit 12 inch long, completely finished units of specified factory-fabricated products exposed as finished work.

D. Samples: Submit two samples 12 by 12 inch in size illustrating metal finish color.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

1.07 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.

1.08 WARRANTY

A. Manufacturer’s Warranty: Provide manufacturer’s 20-year, non-prorated warranty covering color fade, chalking and film integrity for all “Kynar 500”: pre-finished metal.

B. Contractor’s Warranty: Provide Owner a written warranty which shall warrant sheet metal work to be free of leaks and defects in materials and workmanship for five (5) years after date of final acceptance by Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Sheet Metal Manufacturers
   1. Metal Building Components, Inc.: www.mbci.com

2. Petersen Aluminum Corporation: www.pac-clad.com
3. Vincent Brass and Aluminum Company: vincentmetals.com
4. Substitutions: See Section 01 6000 - Product Requirements

2.02 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239 inch) thick base metal.

B. Pre-Finished Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; minimum 0.02 inch thick, 24 gauge base metal, shop pre-coated with PVDF coating.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. "Kynar 500" or "Duranar 200"
   3. Color: As selected by Architect from manufacturer's full line of colors. Provide custom colors when needed to match other materials shown on the drawings or referenced in the Schedule of Materials and Colors.

C. Aluminum: ASTM B209 (ASTM B209M); 0.032 inch thick; anodized finish of color as selected.
   1. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils thick.
   2. Color Anodized Finish: AAMA 611 AA-M12C22A42/44 Class I integrally or electrolytically colored anodic coating not less than 0.7 mils thick.

D. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 0.032 inch thick; plain finish shop pre-coated with fluoropolymer coating.
   1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's full line of colors. Provide custom colors when needed to match other materials shown on the drawings or referenced in the Schedule of Materials and Colors.

E. Lead: ASTM B749, 2.5 lb/sq ft thick.

F. Stainless Steel: ASTM A666 Type 304, soft temper, 0.015 inch thick; smooth No. 4 finish.

2.03 ACCESSORIES

A. Fasteners: Same material and finish as flashing metal , with soft neoprene washers.
   1. Mechanical Fasteners
      a. Nails: Compatible with material fastened, flathead, wire, barbed, slating type.
      b. Washers: Lead or neoprene.
      c. Screws: Self-tapping sheet metal type compatible with material fastened.
      d. Rivets: Stainless steel and cadmium plated material, closed end, type and size as recommended by sheet metal manufacturer.
      e. Concrete and Masonry Fasteners
         1) Round-head stainless steel screw and neoprene washer with lead expansion anchor, FS FF-S-325, Group IV, Type II.
         2) Acceptable Product: Rawl Plug, The Rawl Plug Company, Inc.

B. Flashing Underlayment
   1. Ultra-Vycor, a self-adhering membrane composed of high density, cross-laminated polyethylene film coated on one side with butyl rubber adhesive, and covered with a disposable silicone-coated release sheet, and conforms to the following physical properties:
   2. Color: Gray-Black
   3. Thickness: 0.76 mm (30 mil); ASTM D 3767 Method A
   4. Tensile Strength: 250 psi; ASTM D 412
   5. Elongation: 250%; ASTM D 412

6. Low Temperature Flex: Unaffected at -20F
7. Adhesion to Plywood: 525 N/m; ASTM D 903; (3.0 lb/in width)
8. Permeance (Max): 2.9 ng/msPa; ASTM E 96
9. Material Weight: 1.1 kg/m (0.22lb/sq ft)

C. Mastic Sealant: One- or Two-Part Polyurethane; non-hardening, non-skinning, nondrying, non-migrating sealant.

D. Bituminous Coating: FS TT-C-494 or SSPC Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15 mil dry film thickness per coat.

E. Adhesives: Type recommended by flashing sheet manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet.

F. Metal Accessories: Sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gauge required for performance.

G. Elastic Flashing Filler: Closed cell polyethylene or other soft closed cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

H. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, non-corrosive.

I. Flux: Phosphoric acid type, manufacturer's standard. For use with steel or copper: Rosin flux

2.04 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 four inches wide, interlocking with sheet.

C. Form pieces in longest possible lengths.

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. Lap joints 1-inch minimum. Rivet and solder joints on parts that are to be permanently and rigidly assembled.

G. Expansion Provisions: Where lapped or bayonet type expansion provisions in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant concealed within joints.

H. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance or work, form metal to provide for proper installation of Elastomeric sealant in compliance with SMACNA standards.

I. Tin edges of copper sheet to be soldered; solder shop formed metal joints, and after soldering, remove flux, wipe and wash solder joints clean; provide weathertight joints.

J. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

K. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

L. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.05 FABRICATED ITEMS

A. Coping Cap Flashings:
1. Minimum 24 gauge Kynar 500 pre-finished galvanized steel formed in maximum 10 feet length sheets.

2. Provide expansion slip joints at maximum 10 feet on center.

B. Flashings and Counterflashings:
   1. Minimum 24 gauge hot-dip galvanized steel formed in maximum 10 feet lengths.
   2. All flashings and counterflashings exposed to view shall be Kynar 500 pre-finished galvanized steel

C. Drip Flashing:
   1. Drip flashing shall be minimum 24 gauge Kynar 500 pre-finished galvanized steel formed in maximum 10 ft. lengths.

D. Roof Penetrations and Umbrella Counterflashing: Minimum 24 gauge hot-dip galvanized steel two piece construction, fabricated in accordance with approved shop drawings.

E. Metal Edge:
   1. Minimum 24 gauge Kynar 500 pre-finished galvanized steel formed in maximum 10 ft. lengths.
   2. Provide expansion slip joints at maximum 10 ft. on center.

F. Continuous Cleats: 22ga. continuous strips, hot dipped galvanized sheet metal.

G. Vent Pipe, Heat Vent Hoods, Sleeves, Pitch Pans, and Accessories: Minimum 24 gauge pre-finished, or hot-dip grip galvanized steel.

H. Gutters, Downspouts and Scupper Sleeves: Minimum 24 gauge Kynar 500 pre-finished galvanized steel. Lap joints minimum 3 inch. Seal laps with structural sealant and rivet. Coordinate downspouts with steel boots per drawings. Provide expansion joints in gutters per SMACNA guidelines, 50'-0" o.c. max.
   1. Downspout Boots shall be fabricated as specified in Section 05 5000 and as detailed on the drawings.

I. Expansion and Control Joints: 24 gauge hot-dip galvanized steel formed in 10 ft. maximum lengths where possible. Fabricate in accordance with SMACNA reference details, Ref. Plate 5-5a, 5-5b for field installations; Ref. Plates 5-6a & 5-6b for wall conditions.

J. Vent Stack, Soil Vent, Flashing: 4 pound lead. Fabricate and install in accordance with approved shop drawings.

K. Vent Pipe Flashing: 24 gauge hot-dip galvanized steel.

L. Roof Drain Flashing: 2.5 pound lead sheet, minimum 36” x 36” square. Fabricate and install as shown in NRCA Roofing and Waterproofing Manual.

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.

3.03 INSTALLATION

A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form ¼ inch hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Pre-fabricated corners or transitions are required at changes in direction, elevation, or plane and at intersections. Locate field joints not less than 12 inches, nor more than 3 feet from actual corner. Laps shall be 1 inch, riveted and soldered at following locations: Prefabricated corners; transitions; changes in direction, elevation, and plane; and at intersections.

B. Anchor units of work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners where possible; and set units true to line and level as indicated. Install work with laps, joints and seams which are permanently watertight and weather proof.

C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

D. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces with zinc chromate, bituminous coating, or other permanent separation at locations or contact as recommended by manufacturer or fabricator. Do not use materials incompatible with roofing system.

E. Continuous Cleat: At exposed edges of gravel guards, fascias, coping cap and metal edge gravel guard and where required otherwise, attach galvanized continuous cleat nailed staggered at six (6) inches on center. Nails shall be annular threaded galvanized nails, with a minimum of 1.5 inches in length, and seated on the vertical flange of the cleat. Cleat shall be one gauge heavier than adjacent sheet metal item or a minimum of 22 gauge.

F. Flanges: Bed flanges of work in thick coat of bituminous roofing cement where required for waterproof performance.

G. Coping: Minimum 24 gauge pre-finished galvanized steel.

H. Coping Cap Flashings
   1. Install over underlayment and slip sheet.
   2. Lock bottom flanges to edge strips.
   3. Join sheets in accordance with SMACNA details.
   4. Fasten back of coping with fasteners and neoprene washers 8 inches on center through pre-drilled slotted holes.

I. Flashings and Counterflashings
   1. Extend flanges into reglet and securely fasten.
   2. Where nailing is required, nail at 6 inches on center.
   3. Overlap 4 inches on base flashing; lap ends at 3 inches.
   4. Or, depending on other construction, install counterflashing in reglets, either by snap in seal arrangement or by wedging in place with lead wedges at 8 inches on center for anchorage and filling reglet with elastomeric sealant as indicated and as required for specific exposure.
   5. All sheet metal counterflashing shall include a galvanized hook strip, placed a minimum of three feet on center or as required by local code or wind uplift requirement.

J. Metal Edge
   1. Install with allowance for movement between sections and seal with six (6) inch minimum cover plates.
   2. Extend flanges 4 inches onto roof surface.
   3. Install sealant between flange and substrate.
   4. Fasten 3 inches on center in two staggered rows.

K. Roof Penetration Hoods and Umbrella Counterflashings
   1. Install watertight hood or umbrella counterflashing at sleeves and penetration locations, such as pipes and conduit penetration roof, and at equipment supports and over pitch pans.
   2. Set umbrella counterflashing in sealant.
   3. Fully solder connections and seams and install in accordance with approved shop drawings.
   4. Tighten draw bands.
   5. Seal top of umbrella counterflashing with sealant.

L. Reglets
   1. Install reglets to receive counterflashing in manner and by methods indicated.
   2. Where shown in concrete, furnish reglets to trades of concrete work for installation as part of work in Division 3 Sections.
   3. Where shown in masonry, furnish reglets to trades of masonry work for installation as part of work in Division 4 Sections.

M. Expansion Joint Flanges
   1. Nail flanges of expansion joint units to curb nailers at maximum spacing of 6 inches.
   2. Fabricate seams at joints between units with minimum 3 inches overlap to form continuous waterproof system.

N. Drip Flashing
   1. Install over Rosin Paper.
   2. Furnish drip flashing to trades of masonry work for installation as part of work in specifications, Division 04 Sections.

O. Rooftop Unit Receiver Trim
   1. Install receiver flashing at rooftop units. Receiver clip shall allow RTU to be set on curb prior to roof membrane installation. Refer to drawings for detail.

3.04 CLEANING

A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean and free of stains, scrap, and debris.

B. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

C. Prime soldered area of phosphatized metal after cleaning to prevent rusting.

3.05 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 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured curbs and equipment rails.

B. Equipment rails.

C. Roof hatches, manual and automatic operation, including smoke vents.

D. Pipe Stands.

E. Roof Davit Cranes

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking.

B. Section 07 5400 - Thermoplastic Membrane Roofing.

C. Section 07 6113 - Standing Seam Sheet Metal Roofing.

D. Section 07 6200 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; current edition.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

E. FM (AG) - FM Approval Guide; current edition.

F. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 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.
   5. For smoke hatches, submit evidence of approval by evaluation agency specified.

C. Certificate: For smoke hatches, provide certificate of approval from authority having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Remove protective wrapping immediately after installation.

C. Store products under cover and elevated above grade.

D. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier’s freight bill of lading.

1.06 WARRANTY

A. Comply with requirements of Section 01 7800 – Closeout Submittals.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace roof accessories that fail in materials or workmanship within the specified warranty period.
   1. Roof Scuttle Warranty Period: Five (5) years after date of Substantial Completion.
   2. Automatic Smoke/Fire Vent Warranty Period: Five (5) years after date of Substantial Completion.
   3. Roof Pipe Stands Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Manufacturers:
   1. Thybar Corporation: www.thybar.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. 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. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
   2. Sheet Metal Material:
   3. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G60 coating designation; 18 gage, 0.048 inch thick.
   4. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
      a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch clearance between curb and metal roof panel flange allowing water to properly flow past curb.
      b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
      c. Maintain at least 12 inch clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
      d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.
   5. Provide layouts and configurations indicated on drawings.
   6. Curb shall be sized to allow space for flashing. Reference drawings for flashing detail. Roof curb shall allow for units to be set prior to roof material completion. Coordinate curb size with Mechanical drawings.

C. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.
   2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
   3. Height Above Roof Deck: 18 inches, minimum.
   4. Model TC-2 for equipment support curbs.
   5. Model TC-3 for roof curbs.

D. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
   1. Equipment supports shall span a minimum of two structural members.
   2. Model TEMS-3 for equipment rails

2.02 ROOF HATCHES, MANUAL AND AUTOMATIC OPERATION

A. Roof Hatch Manufacturers:
   1. Babcock-Davis: www.babcockdavis.com/sle.
   2. Bilco Company: www.bilco.com/sle.
   3. Milcor, Inc: www.milcorinc.com.
   4. Elmdor/Stoneman Manufacturing Company: www.elmdorstoneman.com
   5. Nystrom, Inc: www.nystrom.com.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
   1. Style: Provide flat metal covers unless otherwise indicated.
      a. Basis of Design: Bilco Scuttle Type S, size width: 3'-0" x length: 2'-6". Length denotes hinge side. The roof scuttle shall be single leaf. The roof scuttle shall be pre-assembled from the manufacturer.
   2. Mounting: Provide frames and curbs suitable for mounting conditions as indicated on drawings.

C. Smoke and Heat Vents: Where "smoke" or "smoke/heat" operation is indicated, provide following additional features and omit manual operation for access.
   1. Basis of Design: Bilco Fire vent Type DSH, size: width (60”) x length (120”). Length denotes hinge side. The roof fire vent shall be double leaf. The roof fire vent shall be preassembled from the manufacturer.
   2. Smoke Release Mechanism: Automatic opening on melting of replaceable UL (DIR) listed fusible link at 165 deg F.
   3. UL (DIR) or FM (AG) listed as automatically operated smoke and heat vent.

D. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   1. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.
   2. Curb Height: 12 inches from finished surface of roof, minimum.

E. Metal Covers: Flush, insulated, hollow metal construction.
   1. Capable of supporting 40 psf live load.
   2. Insulation: Manufacturer's standard 1 inch rigid glass fiber.
   3. Gasket: EPDM, continuous around cover perimeter.
   4. Entire scuttle shall be weather tight with fully welded corner joints on cover and curb.

F. Safety Railing System: Manufacturer's standard accessory safety rail system mounted directly to curb. Provide where hatch is locted within 10' of the roof edge or as required by OSHA standards.
   1. Comply with 29 CFR 1910.23, with a safety factor of two.
   2. Posts and Rails: Fiberglass reinforced polymer.
   3. Gate: Same material as railing; automatic closing with latch.
   4. Finish: Manufacturer's standard; molded in integral safety yellow.
   5. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
   6. Mounting Brackets: Hot dipped galvanized steel, 1/4 inch thick, minimum.
   7. Fasteners: Stainless steel, Type 316.

G. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
   1. Lifting Mechanisms: Compression spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.

2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Smoke Hatches: Manual release operation not to disturb automatic release mechanisms; easy resetting by Owner's maintenance personnel; provide latch designed to prevent relatching unless automatic release mechanism has been properly reset for automatic operation.
7. Locking: Padlock hasp on interior.

2.03 PIPE STANDS

A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following manufacturers.
   1. Miro Industries, Inc.: www.miroind.com
   2. MAPA Products: www.mapaproducts.com
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Gas Piping
   1. Provide a "roller-bearing" pipe support used to support roof-mounted gas piping. Pipes rest on a self-lubricating roller system which is made of a stainless steel rod and a sturdy polycarbonate resin roller. The pipe support base is made of polycarbonate resin, the roller rod is made of glass-filled nylon, and all metal parts are made of stainless steel. Pipe stand will accommodate up to 4" pipe (inside diameter) up to 5" outside diameter pipes. Pipes shall be supported at a minimum distance of 6” off of the roof deck.
   2. Product Requirements
      a. Load Weight: Maximum load weight may not exceed 125 lbs. per pipestand.
      b. Model Number: 4-RAH – Miro Industries
      c. Size: Base - 9" x 15.12", with adjustment from 2.75" to 7.0" above roof membrane.
      d. Spacing: Not to exceed ten (10) foot centers.

C. Condensate Piping
   1. Provide a threaded rod "clamp" pipe support used to support roof-mounted condensate piping. Pipes are stabilized by a rubber cushion provides vibration isolator. System is made of a stainless steel rod and pipe clamp. The pipe support base is made of Molded 33% Fiberglass Reinforced 6/6 nylon. Support pad is .125 ml black Neoprene.
   2. Pipe stand will accommodate up to 2" copper pipe. Pipes shall be supported at a minimum distance of 6” off of the roof deck.
   3. Product Requirements
      a. Load Weight: Maximum load weight may not exceed 75 lbs. per pipestand.
      b. Model Number: MS-1 – MAPA Products
      c. Threaded rod: 3/8” - Grade 304 SS ATR
      d. Size: Base – 8” Octagonal, with an adjustment from 6" to 10" above roof membrane.
      e. Spacing: Not to exceed ten (10) foot centers.

2.04 ROOF DAVIT CRANES

A. Fixed rooftop davit cranes to be provided at each roof access hatch.

B. Manufactures:
   1. McMaster-Carr: www.mcmaster.com.
   2. Substitutions: See Section01 6000-Product Requirements.

C. Basis of Design:
   1. Stationary Hand-Winch Crane, Style B as manufactured by McMaster-Carr.
   2. Winch Type: Wire rope with automatic brake.
   3. Material: Powder coated steel.

4. Arm Length: 42".
5. Retracted Arm Capacity: 500 lbs.
6. Lift Length: 34 feet.
7. Overall Height: 5'-10"
8. Rotation 360 degrees.

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.

B. Pipe Stands
   1. Pipe stand shall be adjusted in height to distribute load evenly.
   2. Provide an additional sheet of roofing material under all pipe stands.
   3. All loose aggregate shall be removed from the area directly beneath the pipe stand.

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 7600
ROOF PAVERS AND PEDESTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adjustable Deck Pedestals

B. Roof Pavers

C. Planters and Benches

1.02 REFERENCES

A. ASTM D 1238-04 – Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.

B. ASTM D 792-00 – Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

C. ASTM D 638-03 – Standard Test Method for Tensile Properties of Plastics

D. ASTM D 256-06 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

E. ASTM D 648-06 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

1.03 SUBMITTALS

A. Submit under provisions of Section 01 3000 – Administrative Requirements.

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. Installation methods.
      a. Shop Drawings: Submit shop drawings detailing the installation methods. Coordinate placement with locations noted on the Contract Drawings.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.
      a. Installer Qualifications:
         1) The deck support system installer must have a minimum of two (2) years proven construction experience, be capable of estimating and building from blueprint plans and details, determine elevations, and properly handle materials. All Work must comply with the Manufacturers installation application procedures for deck support work specified herein.
      b. Special Considerations:
         1) The contractor assumes the responsibility for and must take into consideration the structural capability and adequacy of the structure to carry the dead and live load weight(s) involved, and that the density of any insulation is satisfactory to resist crushing and damaging the waterproofing membrane.
      c. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
         1) Finish areas designated by Architect.
         2) Do not proceed with remaining work until workmanship is approved by Architect.
         3) Refinish mock-up area as required to produce acceptable work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store Deck Supports and system components with labels intact and legible.

B. Inspect all delivered materials to insure they are undamaged and in good condition.

C. Store and dispose of solvent-based materials such as construction adhesive, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 PROJECT CONDITIONS

A. There are no pedestal installation temperature restriction guidelines other than the practical considerations of working in any unsafe condition or inclement weather.

B. Deck supports specified are to be for used with pedestrian traffic only.

C. Pedestrian decks must be restrained by perimeter blocking or walls on all sides. Lateral movement greater than 1/8” is unacceptable and will be rejected.

D. Heavy Roof Top Features: Flat bottom features such as planters, heavy benches, etc. always require individual support that is in addition to the deck pedestal system.
   1. A minimum of one additional pedestal support must be installed for every 500 lbs. (or portion thereof) of static loading. These additional support pedestals must be installed directly under the decking and evenly spaced immediately below the feature locations. One additional pedestal must be placed under corner of any rectangular feature.
   2. When installing Bench or Planter Cubes, additional support may be needed under the center and corners of the cubes depending on the size and anticipated weight loads.
   3. Features supported by legs or feet are not advised or considered unacceptable because of the consequences of point loading.
   4. Any feature that creates vibration must be provided for in special consultation and written agreement with the Manufacturer. Cell phone towers, heavy planters and other similar features require their own separate curb designed by an architect or engineer.
      a. All decks shall be designed to not exceed the design capacity of the pedestal.
         1) The substrate immediately below the pedestals shall provide positive drainage.
         2) In the case of decks over roofing substrates, roof systems must meet local building code and be in accordance with the NRCA recommended good construction practices. Only roofing manufacturer approved systems shall be used.
      b. Decks over roofing and waterproofing:
         1) Pedestals must be installed on surfaces with a minimum 40 psi bearing capacity.
         2) Pedestals must be supported by a surface that provides a minimum 40 psi bearing capacity.
         3) Enlarged Pedestal Base: Install an enlarged base that supports the pedestal to distribute the anticipated loaded weight of a pedestal over an enlarged area on roof systems that incorporate 20 psi common insulation boards.

1.07 WARRANTY

A. At project closeout manufacturer shall provide to the Owner an executed copy of the manufacturer’s standard document outlining the terms, conditions and limitations of their limited warranty against manufacturing defect for a period of three (3) years.

B. The Contractor warrants that his work will remain free from defects of labor and materials used in conjunction with his work in accordance with the General Conditions for this project or a minimum of three (3) years.

C. It is the responsibility of the Contractor installing the product listed in this section to coordinate warranty requirements with any related sections or adjacent Work. Notify the Architect immediately of any potential lapses or limitations in warranty coverage.

D. For use with pedestrian traffic only – No wheeled, motorized or equipment traffic.

E. Decks should be restrained on all sides and not have lateral movement in excess of 1/8" .

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Pedestal and Paver Systems:
   1. Bison Innovative Products: www.BisonIP.com
   2. Substitutions: See Section 01 6000 – Product Requirements

B. Planters, Cubes and Benches:
   1. Bison Innovative Products: www.BisonIP.com
   2. Substitutions: See Section 01 6000 – Product Requirements

2.02 APPLICATIONS/SCOPE

A. Basis of Design: Versadjust, adjustable V-Series pedestal system as manufactured by Bison Innovative Products.

B. Furnish and install a complete adjustable deck support system with a maximum cavity height of up to:
   1. Versadjust Pedestals maximum cavity height 24 inches (610 mm).
   2. Versadjust Pedestals with Bison Brace System for excess height installations in the range of 24-36 inches.
   3. Deck supports are not designed for supporting decks that carry vehicular traffic or equipment including but not limited to snow removal equipment, ATV's, forklifts, or any motorized vehicles.
   4. Consult the Manufacturer and the Project Engineer regarding the following:
      a. When spacer tab condition or design requires spacing between decking tiles or concrete pavers other than the standard spacing required by the manufacturer.
      b. When considering use for other than a raised decks (e.g. interior floors, stairs, etc.).
      c. When the required pedestal height exceeds the safe limits as determined by the Manufacturer.
      d. When pedestal load capacity exceeds the maximum listed.
      e. When anticipating installation of any items with excess weight on top of the deck.
      f. When greater pedestal load capacity is required.

2.03 DECK PEDESTALS

A. Typical Height Range 2 ¼" -36 inches, Weight Bearing 1250 lbs/pedestal (FS:3) V-Series Pedestals

B. Adjustable Pedestals:
   1. Material: Mineral Filled High Density Copolymer Polypropylene.

C. Base Leveler Disks:
   1. Model: LD4 - Placed beneath pedestals to compensate for slopes up to 1 inch per foot.
   2. Slope: 1/4 inch per foot each. Two additional LD4 units may be added.
   3. V Series Pedestals include two (2) Model VB Integral Base Leveler Disks.
   4. All other pedestals may stack up to four LD4's under one pedestal for up to 1 inch of slope compensation.
   5. Dimensions: Center point thickness 3/8 inch (9.5mm).

D. Shims:
   1. Model: B11 Flexible Shim 1/16 inch
      a. Use no more than 4 shims. If using only 1/4 segment, adhere it to the pedestal with construction adhesive.
      b. Material: (1.5mm) Sanaprene.

2. Model: PS1 Rigid Poly Shims 1/8 inch (3.175mm
    a. Use no more than 2 shims. If using only 1/4 segment, adhere it to the pedestal with construction adhesive.
    b. Material: Mineral Filled High Density Copolymer Polypropylene.
3. Model: BB-Wedge
    a. Spacing Wedge
    b. Material: Mineral Filled High Density Copolymer Polypropylene.

E. Base Pads:
1. Model FIB: Pedestal base pad for use on roofing and waterproofing installations over low density insulation, provides a large 12 inch by 12 inch x 11/16 inches (305mm x 305mm x 17.5mm) base bearing surface.
2. Material: Mineral Filled High Density Copolymer Polypropylene. FIB also contains galvanized metal pad.

F. Brace System:
1. Required for Installations 24”-36” in height or for applications requiring additional stability.
2. Model: BB-C – Bison Brace Collar, Fits Model V3 & V4 only
3. Model: BB-S – Short Brace Kit
    a. For 16”-22”wide Deck Tiles
    b. Kit contains 2 each 8” long brace pieces, Screw & Nut
4. Model: BB-L Long Brace Kit
    a. For 22”-36” wide Deck Tiles
    b. Kit contains 2 each 16” long brace pieces, Screw & Nut
5. Model: BB-Pegs
    a. Individual pegs to be inserted into Versadjust Pedestal Base
6. Model: BB-P
    a. Pegs pre-inserted into Versadjust Pedestal Base at the factory
7. Add to any Versadjust Pedestal Model as required

2.04 ROOF PAVERS

A. Paver Material: WT-IPE-24-RIBBED Ipê Wood Tile

B. Dimensions: 23.875” x 23.875” x 1.69” nominal.

C. Weight per tile: 24 lbs. Weight per square foot: 6 PSF.

D. Fire Rating: Class A – meets and exceeds ASTM E108 Spread of Flame Test.

E. Color: Brown (NOTE: Tiles are a natural product and have variations in color and grain.)

F. Surface: Ribbed.

2.05 ALUMINUM CUBES

A. Product: Bison; CUBE-PC-SILVER

B. Dimensions: As indicated on the drawings

C. Metal Finish and Colors:
1. Powder coated Aluminum
2. Refer to Section 01 6210 - Schedule of Materials and Colors for approved color selection.

2.06 PLANTERS AND BENCHES:

A. Aluminum Planter/Bench
1. Construction: 0.90 Marine Grade Aluminum (3/32 inches thick).
2. Drainage: Standard Drainage holes and Irrigation Sleeve included.
3. Size: Provide sizes and tops as indicated on the drawings
4. Metal Finish and Colors:
    a. Powder coated Aluminum

b. Refer to Section 01 6210 - Schedule of Materials and Colors for approved color selection.

B. Tops:
1. IPE Hardwood Tops where indicated on the drawings
2. Finish: Natural Wood

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 all elevations, required pedestal heights and deck dimensions before commencing work.

3.02 PREPARATION

A. Establish accurate lines, levels and pattern.

B. The substrate surface that will receive the deck supports must be structurally capable of carrying the dead and live loads anticipated.

C. The substrate must be clean and free of projections and debris that could impair the performance of the pedestals or the total deck system.

D. Decks over roofing and waterproofing: verify that installation conforms to section 1.07 of this specification.

E. Installation requirements vary for each individual project site. Deck materials used, pattern, grid layout, starting point, and finished elevation shall be shown on plan view shop drawings which have been prepared and approved by the designer, installing contractor and/or owner.

F. Once a starting point and the finished elevation of the deck surface have been determined, the support system elevation (finished elevation minus deck material thickness) is established and marked around the perimeter using a transit “torpedo” water level or laser leveling device.

G. Precise measurements shall be taken and deck area shall be accurately defined. Mark off and square all outside edges with control lines (chalk lines or spray paint). Install two (2) lines that are perpendicular to each other across the deck area. Continue to mark a grid of lines in both directions marking the location of each pedestal. To assure a square layout, use the control lines as references to periodically check the layout during installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. As required, place a Floating Insulation Base (FIB) board or Floating Foundation Base (FFB) in the location on the grid of each pedestal.

C. Install a deck support where each measured grid line meets the perimeter. Remove two (2) spacer tabs in line with one another on top of each deck support placed around the perimeter. Remove all four (4) spacer tabs at corners.

D. Adjust each deck support to a “top of pedestal” elevation marked around the perimeter. Deck support shall be positioned as close to the perimeter as possible, with the two remaining spacer tabs aligned with the grid line. Using the “top of pedestal” elevation marked on the perimeter, stretch a mason’s line along and slightly ahead of the second row of deck supports. A laser leveling device shall be used for this purpose.

E. On larger decks, pedestals shall be pre-sorted and pre-set to the proper elevation and placed in position prior to the installation of pavers or tiles.

F. As the deck supports located along the grid lines are loaded with pavers or tiles, fine vertical adjustment can be made by rotating the base or bottom of the deck support. Clockwise rotation of the pedestal base will raise the bearing surface and the deck. Counter-clockwise rotation will lower the top bearing surface.

G. Pedestals have built in height limit indicator 'bumps'. When pedestal is fully extended, height limit indicator "bumps" will be felt and heard, indicating the maximum height of the pedestal. Do not extend pedestal beyond the height limit indicators. Do not exceed maximum height listed on pedestal, use the next size pedestal. A coupler must be added to achieve greater heights. Always maintain adequate thread engagement. Never over extend any pedestal.

H. Slight irregularities in decking panel thickness can be compensated for by using one to two shim segments. Place on top of the pedestal, under the corner(s) of the decking tile or paver. Use no more than two (2) shims on top of the pedestal and always adhere 1/4 wedges with construction adhesive.

I. Stackable Fixed Height Pedestals: Complete deck and grid layout as instructed above. Stack no more than four (4) fixed height pedestals together and place in lieu of adjustable pedestals where needed. Spacer tabs can be removed to accommodate perimeter and corner support locations.

J. Slope Compensation:
   1. Provide integrated base leveler disks that compensate for up to ½ inch per foot slope. Additional slope compensation can be added by placing two additional disks under the pedestal base to compensate for up to 1 inch per foot of slope.
   2. Place the thickest edge of the disk (located on the edge by a small finger tab) at the down slope side of the deck support, one disk compensates for 1/4 inch per foot of slope. Using two to four disks, rotate one in relation to the other to create a level deck support.
   3. Shims may be used in multiples, whole or segmented, and placed under the base to level the deck support.
   4. Under a pedestal: All shims under a pedestal must be adhered to each other or the pedestal (NOT to the roofing membrane) with construction adhesive. Shim no more than 1/8 inch (3mm) beneath each pedestal.
   5. On top of a pedestal: Use no more than 2 shims.

3.04 PEDESTAL BRACING

A. Excess Height: Required for added Stability for Installations 24"-36" in height

B. For Installations requiring additional stability.
   1. One level of brace collars must be installed at the mid-point height of the pedestal column. Once the standard height is established (i.e. 18" for 36" overall height) that same level of Collar placement must be maintained. NOTE: Final adjustment for top of deck height must be made prior to setting the standard height for the Brace Collars.
      a. Short Brace
         1) Install around the outside perimeter of a walk deck where pedestals are installed where less than the typical 24" spacing occurs and shorter arms are required.
      b. Long Brace
         1) Install in the interior area of a walk deck where pedestals and 23 - 7/8" x 23 – 7/8" surfacing panels are installed providing uniform 24" spacing.
      c. Install braces by placing the two-hole brace ends over the self-locking pegs on collar or base, fit brace arms together making sure all brace teeth are firmly interlocked and secure with Screw and Wing Nut. Braces should be installed as tightly as possible to create a rigid bracing system between each vertical pedestal column.
      d. Two brace arms extend outward from each corner pedestal in perpendicular rows. This results in a series of braces attached to collars in each horizontal direction from one side of the deck to the other and from one end to the other.

e. Once the horizontal perpendicular run(s) of braces are properly installed at the correct height(s), the deck surfacing panels may be installed as the decking system progresses.

3.05 DECK SUPPORT PLACEMENT AND FINAL ADJUSTMENT

A. Deck supports and the deck surface panels must be placed as the manufacturer directs in these written instructions. Use of labor saving devices, such as paver lifters, is encouraged, especially on large jobs.

B. Pedestals are designed to be rotated for final slight adjustment when pedestals are fully loaded. Deck supports should be leveled in each succeeding row as the installation proceeds. Final height adjustment or maintenance is easily made by simply rotating the base in a clockwise or counter-clockwise direction to raise or lower the deck surface material.

C. Additional sections of shims may be used and should be available for regular maintenance. Shims may be used in multiples, whole or segmented, and placed under the base or on top the pedestal to level the deck support.

D. On top of pedestal: Use construction adhesive to adhere sections of shims. Construction adhesive is not required when using whole shims on top of a pedestal.

E. Beneath a pedestal: Use a small amount of construction adhesive to adhere sections of shims and/or whole shims to each other or to the pedestal. Unless specified to do so, DO NOT use construction adhesive to adhere pedestal or shims to insulation, roofing or waterproofing membrane.

3.06 PERIMETER CONTAINMENT

A. Any area of a deck that is not restrained by a parapet or foundation wall must be ‘boxed-in’ and contained. The deck panels will move if all sides are not adequately restrained. Perimeter containment located at the outside of the deck must be installed to provide restraint. No movement should be allowed at the perimeter of the deck system greater than 1/8” .

3.07 FIELD QUALITY CONTROL

A. Inspect often during installation to assure that grid spacer lines are being maintained in a straight and consistent pattern and that deck panels or pavers are level and not rocking.

B. Confirm that deck pedestal height does not exceed the specified height for the product series:

C. 24 inches (610mm) maximum pedestal height unless using a Brace System.

D. Unless otherwise specified in writing to allow for expansion, inspect to assure that all paver spacing between tiles and at perimeter containment does not exceed a 1/8” . Particular attention should be made to assure that all pedestrian entry or access points to the deck are level and that the deck surface tiles are not randomly raised or uneven creating a tripping or safety hazard.

3.08 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.09 IMMEDIATELY FOLLOWING INSTALLATION

A. The Owner, or the Owner’s Agent, shall carefully inspect the deck system to be positive that:
   1. The new deck system is adequately blocked on all sides to contain the surface decking and related components.
   2. There is no more than 1/8” spacing between any deck panels and at all sides of the deck perimeter.
   3. There is no ballasting rock used to fill in any perimeter voids.
   4. There is no ‘rocking’ of deck panels as foot traffic is applied to the surface decking.
   5. All required spacer tabs are in place and visible.

3.10 ROUTINE MAINTENANCE AND CARE

A. Installer and/or Architect has a duty to instruct the deck owner about performing routine maintenance of the deck. Check for rocking pavers and adjust or shim immediately. Substrates can settle and pedestals may have to be readjusted. Failure to do so can cause a tripping hazard. Periodically check spacer tabs and immediately replace broken tabs to limit deck movement. Make sure the edge restraint stays intact and structurally sound.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not , and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 01 1400 - Work Restrictions

B. Section 01 4533 - Code-Required Quality Control

C. Section 01 7000 - Execution and Closeout Requirements: Cutting and patching.

D. Section 09 2982 - Gypsum Board: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.

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 (Reapproved 2019).

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. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

G. ITS (DIR) - Directory of Listed Products; current edition.

H. FM 4991 - Approval Standard for Firestop Contractors; 2013.

I. FM (AG) - FM Approval Guide; current edition.

J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

K. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

L. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

M. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 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 Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Certificate from authority having jurisdiction indicating approval of materials used.

G. Installer Qualification: Submit qualification statements for installing mechanics.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with ASTM E119 and ASTM E814.
   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.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

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. Approved by Factory Mutual Research Corporation under FM 4991

1.06 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. A/D Fire Protection Systems Inc: www.adfire.com/#sle.
   3. Everkem Diversified Products, Inc: www.everkemproducts.com/#sle.
   4. Hilti, Inc: www.us.hilti.com/#sle.
   5. Nelson FireStop Products: www.nelsonfirestop.com/#sle.
   6. Specified Technologies Inc: www.stifirestop.com/#sle.
   7. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   8. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Mold and Mildew Resistance: Provide firestoppping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

E. 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.

B. Head-of-Wall 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 floor or wall, whichever is greater.

C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor 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.

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.

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.

B. Sealants or caulking materials for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 604 Self-Leveling Firestop Sealant
   3. Hilti CP 620 Fire Foam
   4. Hilti CP 606 Flexible Firestop Sealant
   5. Hilti CP 601s Elastomeric Firestop Sealant
   6. 3M Fire Stop Sealant 2000
   7. 3M Fire Barrier CP25 WB
   8. Tremco Tremstop Fyre-Sil Sealant

C. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
   1. Hilti CP 601s Elastomeric Firestop Sealant
   2. Hilti CP 606 Flexible Firestop Sealant
   3. Hilti FS-ONE Intumescent Firestop Sealant

D. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:
   1. Hilti CFS-SP WB Firestop Joint Spray
   2. Hilti CP 601s Elastomeric Firestop Sealant
   3. Hilti CP 606 Flexible Firestop Sealant
   4. Hilti CP 604 Self-Leveling Firestop Sealant
   5. 3M Firestop Sealant 2000
   6. Tremco Tremstop Fyre-Sil Sealant

E. Intumescent sealants or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. 3M Fire Barrier CP25 WB
   3. Tremco Tremstop WBM Intumescent Firestop Sealant

F. Intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 618 Firestop Putty Stick

3. 3M Fire Barrier CP25 WB
4. Tremco Tremstop WBM Intumescent Firestop Sealant

G. Intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:
1. Hilti FS-ONE Intumescent Firestop Sealant
2. Hilti CP 618 Firestop Putty Stick
3. 3M Fire Barrier CP25 WB
4. Tremco Tremstop WBM Intumescent Firestop Sealant

H. Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:
1. Hilti CP 618 Firestop Putty Stick

I. Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:
1. Hilti CP 618 Firestop Putty Stick

J. Wall opening protective materials for use with UL listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
1. Hilti CP 617 Firestop Putty Pad

K. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
1. Hilti CP 642 Firestop Collar
2. Hilti CP 643 Firestop Collar
3. Hilti CP 645 Firestop Wrap Strip
4. 3M Fire Barrier PPD Plastic Pipe Device

L. Cast-in place firestop devices for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:
1. Hilti CP 680 Cast-In Place Firestop Device
2. Hilti CP 681 Tub Box Kit for use with tub installations

M. Materials used for large size/complex penetrations made to accommodate multiple steel and cooper pipes, electrical busways in raceways, the following products are acceptable:
1. Hilti FS 635 Trowelable Firestop Compound
2. Hilti FS 657 FIRE BLOCK
3. Hilti CP 620 Fire Foam
4. 3M Firestop Foam 2001
5. 3M Fire Barrier CS-195 Composite Sheet

N. Cables passing through fire-rated floors or walls shall pass through fire-rated wiring devices which contain an intumescent insert material that adjusts automatically to cable additions or subtractions.
1. Hilti FS 657 FIRE BLOCK
2. Specified Technologies Inc., EZ-PATH Fire Rated Pathway

O. Sealants or caulking materials used for openings between structurally separate sections of wall and floors, the following products are acceptable:
1. Hilti CP 672 Firestop Spray
2. Hilti CP 601s Elastomeric Firestop Sealant
3. Hilti CP 606 Flexible Firestop Sealant
4. Hilti CP 604 Self-Leveling Firestop Sealant
5. 3M Fire Barrier CP 25 WB

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.

C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

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 RELATED REQUIREMENTS

A. Section 01 4000 – Quality Requirements

B. Section 03 3000 – Cast-In-Place Concrete

C. Section 04 2000 – Unit Masonry

D. Section 07 6200 – Sheet Metal Flashing and Trim

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

B. ASTM C834 - Standard Specification for Latex Sealants; 2017.

C. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.

D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2018.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).

H. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.

I. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

J. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019.

K. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015.

L. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

M. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.

1.04 SUBMITTALS

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

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes 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.
   5. Substrates for which use of primer is required.

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. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
   1. All mastics, glues, and adhesives
   2. Sealant (interior use only)

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of experience.

C. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or other applicable method as recommended by manufacturer.
   1. All joint sealants shall be field tested for proper adhesion to the joint substrates prior to installation. Do not proceed with the work until job site tests have been approved by the Architect.
   2. Locate and provide test joints for each type of joint sealant, and substrate as directed by the Architect.
   3. Acceptable test joints will be used as the standard for all joint sealant work on the project.
      a. Sealants which fail to adhere to the substrates shall be removed and replaced at no extra cost to the Owner.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Hilti, Inc: www.us.hilti.com/#sle.
   2. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
   3. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/#sle.
   4. Pecora Corporation: www.pecora.com/#sle.
   5. Sika Corporation: www.usa-sika.com/#sle.
   6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   7. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
   8. Substitutions: See Section 01 6000 - Product Requirements.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.

1. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
2. Pecora Corporation: www.pecora.com/#sle.
3. Sika Corporation: www.usa-sika.com/#sle.
4. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
5. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. 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, the following items.
      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.
   2. 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. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
         1) Exception: Such gaps and openings in gypsum board and plaster finished stud walls and suspended ceilings.
         2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
      c. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Intentional weepholes 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 non-sag polyurethane sealant, unless otherwise indicated.
   1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
   2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
   3. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
   1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
   2. Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
   3. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
   4. Wall, Ceiling, and Floor Joints Where Tamper-Resistance is Required: Non-sag tamper-resistant polyurethane sealant.
   5. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
   6. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

7. Narrow Control Joints in Interior Concrete Slabs: Self-leveling polyurethane sealant.
8. Other Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

F. Areas Where Tamper-Resistance is Required: As indicated on drawings.

2.03 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
5. Color: Match adjacent finished surfaces.
6. Service Temperature Range: Minus 20 to 180 degrees F.

B. Silicone Sealant: ASTM C920, Grade NS, Use T; single-component, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
2. Color: Dark Gray.

C. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: Match adjacent finished surfaces.
4. Service Temperature Range: Minus 65 to 180 degrees F.

D. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.

E. 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: 50 to 60, 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.

F. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 20 to 35, 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.

G. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .

1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 20 to 35, 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.

H. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.
3. Color: As scheduled.
4. Service Temperature Range: Minus 40 to 180 degrees F.

I. Tamper-Resistant Polyurethane Sealant: ASTM C920, Grade NS, Uses M, G, and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 12-1/2 percent, minimum.
2. Hardness Range: 50 to 60, 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.

J. 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. Service Temperature Range: 40 to 120 degrees F.

K. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: Standard colors matching finished surfaces.
2. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).

L. Non-Curing Butyl Sealant: Solvent-based, single component, non-sag, non-skinning, non-hardening, non-bleeding; non-vapor-permeable; intended for fully concealed applications.

2.04 SELF-LEVELING SEALANTS

A. Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
2. Hardness Range: 0 to 15, Shore A, when tested in accordance with ASTM C661.
3. Color: Gray.
4. Service Temperature Range: Minus 40 to 180 degrees F.

B. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; 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.

C. Self-Leveling Polyurethane Sealant for Horizontal Expansion Joints: ASTM C920, Grade P, Uses T, M and O; multi-component; explicitly approved by manufacturer for horizontal expansion joints.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 30 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: Limestone.

4. Tensile Strength: 200 to 250 psi in accordance with ASTM D412.

D. Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure and 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.

E. Rigid Self-Leveling Polyurethane Joint Filler: Two part, low viscosity, fast setting; intended for cracks and control joints not subject to significant movement.
   1. Hardness Range: Greater than 100, Shore A, and 50 to 80, Shore D, when tested in accordance with ASTM C661.

F. Flexible Polyurethane Foam: Single-component, gun grade, and low-expanding.
   1. Color: White.

G. High Quality Latex-Based Sound Sealant: ASTM C834, Type OP an opaque sealant, and Grade 0 Degrees C (32 Degrees F) meets requirements for low-temperature flexibility.
   1. Color: White.

H. Semi-Self-Leveling Polyurethane Sealant: Intended for expansion joints in sidewalks, swimming pool decks, plazas, floors and other horizontal surfaces with up to 6 percent slope.
   1. Composition: Single or multi-component.
   2. Durometer Hardness, Type A: 35 to 45, minimum, when tested in accordance with ASTM D2240.
   3. Color: Match adjacent finished surfaces.

2.05 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. All Joints: 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, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

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 inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. 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.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

END OF SECTION

SECTION 07 9513
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint cover assemblies for floor, wall, ceiling, and soffit surfaces.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Placement of joint cover assembly frames in formwork.

B. Section 04 2000 - Unit Masonry: Placement of joint cover assembly frames in masonry.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2010.

D. ITS (DIR) - Directory of Listed Products; current edition.

E. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Installation Templates: For frames and anchors to be embedded in concrete or masonry, furnish templates to relevant installers; include installation instructions and tolerances.

1.05 SUBMITTALS

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

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, effected adjacent construction and anchorage locations.

D. Samples: Submit two samples six inch long, illustrating profile, dimension, color, and finish selected of each specified product.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

F. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
   1. All mastics, glues, and adhesives
   2. Thermal insulation (excluding fiberglass, foam, rubber)
   3. Fireproofing
   4. Sealant (interior use only)

G. Certificates - Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements indicated.

1.06 QUALITY ASSURANCE

A. Materials and work shall conform to the latest edition of reference specifications specified here-in and to all applicable codes and requirements of local authorities having jurisdiction.

B. Fire Performance Characteristics - Where indicated, provide expansion joint cover assemblies identical to those of assemblies whose fire resistance has been determined per ANSI/UL 263, NFPA 251, U.B.C. 43-1, or rated period by Underwriters Laboratories, Inc.
   1. Fire Rating - Not less than the rating of adjacent construction.

C. Loading Characteristics - Standard floor covers should be designed to withstand a maximum point load of 500 lbs. without damage or permanent deformation. Heavy-duty covers should withstand a point load of 2,000 lbs.

D. Single-Source Responsibility - Obtain expansion joint cover assemblies from one source from a single manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Balco; a CSW Industrials Company: www.balcousa.com
   2. Construction Specialties, Inc: www.c-sgroup.com.
   3. EMSEAL Joint Systems, Ltd: www.emseal.com/#sle.
   4. Inpro: www.inprocorp.com.
   5. MM Systems Corp: www.mmsystemscorp.com.
   6. Nystrom, Inc: www.nystrom.com.
   7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Floor Joints at all types of Floor Finish :
   1. C-S Group; Model GFT-100 X 2 Floor to Floor Transition
   2. C-S Group; Model GFTW-100 X 2 Floor to Wall Transition
   3. C-S Group; Model PC-100 Floor to Floor Plate Cover

B. Floor Joints at all types of Floor Finish at existing concrete floor slab locations:
   1. C-S Group; Model GFPS-100 Floor to Floor Transition
   2. C-S Group; Model GFPSW-100 Floor to Wall Transition

C. Wall Joints at all types of Walls, Surface Mounted:
   1. C-S Group; Model ASM-100 Flat
   2. C-S Group; Model ASMC-100 Corner Transition

D. Ceiling Joints at Suspended Acoustic Ceiling Finish:
   1. C-S group; Model HC-100 Flat
   2. C-S Group; Model HCW-100 Wall to Ceiling Transition

E. Ceiling Joints at Gypsum Board Ceiling Finish:
   1. C-S Group; Model FWF-100 Flat
   2. C-S Group; Model FWFC-100 Wall to Ceiling Transition

2.03 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
   1. Joint Dimensions and Configurations: As indicated on drawings.
   2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
   3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
   4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.
   1. If floor covering is not indicated, obtain instructions from Architect before proceeding.

2. If style is not indicated, provide extruded aluminum frame both sides, resilient seals, and minimize exposed metal.

C. Resilient Seal Type Covers: Having flat exposed surface without crevices that could collect dirt; designed to withstand expected movement without extrusion of seal from joint assembly; for floors, provide style that is flush with top of floor covering; for exterior joints, weathertight.

D. Sliding Cover Plate Type Covers: Provide plate with beveled edges and neat fit that does not collect dirt.

E. Covers In Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

F. Covers In Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.
1. Acceptable Evaluation Agencies: UL (DIR) and ITS (DIR).

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
1. Exposed Finish Outdoors: Natural anodized.
2. Exposed Finish at Floors: Mill finish or natural anodized.
3. Exposed Finish at Walls and Ceilings: Natural anodized.

B. Resilient Seals:
1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
2. Color: Floor: Gray Ceilings: White.

C. All joints specified for 1" wide. Wider joints, if indicated on the drawings, shall be same model series.

D. Anchors and Fasteners: As recommended by cover manufacturer.

E. Ferrous Metal Anchors: Galvanized where embedded in concrete or in contact with cementitious materials.

F. Threaded Fasteners: Aluminum.

G. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

H. Provide manufacturers associated fire barrier at fire rated walls and floors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine the area and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.02 PREPARATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

3.04 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

B. Provide strippable coating to protect finish surface.

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. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Hollow metal borrowed lites glazing frames.

F. Accessories, including glazing, louvers, matching panels, and removable stops and astragals.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

C. Section 09 9000 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

A. 2012 TAS - Texas Accessibility Standards; 2012.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

G. 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.

H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

L. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

M. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

O. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, 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; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

F. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
   1. All mastics, glues, and adhesives
   2. Thermal insulation (excluding fiberglass, foam, rubber)
   3. Sealant (interior use only)
   4. Fire doors (insulating material)

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

B. 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. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Deansteel Manufacturing, Inc.: www.deansteel.com.
   4. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   5. Mesker, dormakaba Group: www.meskeropeningsgroup.com/#sle.
   6. Pearland Industries, Inc.: www.pearlandindustries.com
   7. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   8. Rocky Mountain Metals, Inc.: www.rockymountainmetals.com.
   9. Steelcraft, an Allegion brand: www.allegion.com/sle.
   10. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. 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.
   2. Accessibility: Comply with ICC A117.1, 2012 TAS and ADA Standards.

3. Typical Door Face Sheets: Flush.
4. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
5. 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.
6. 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 NAAMM HMMA Custom Guidelines: Provide at least A25/ZF75 (galvannealed) for interior applications, and at least A60/ZF180 (galvannealed) or G60/Z180 (galvanized) for corrosive locations.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

C. 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.

D. Doors at interior locations shall be manufactured of cold rolled, or annealed steel. Doors must be of continuously welded, seamless construction with all angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.

E. Doors at exterior locations shall be manufactured of A60 galvannealed or G60 hot dipped galvanized steel. Doors must be of continuously welded, seamless construction with all angles, molds, returns, and miters neatly welded and all weld beads ground smooth for finishing. All exterior doors shall seal tightly and not allow insect pests easy access to the buildings.

F. Face sheets of 16 gauge steel reinforced and sound-deadened by 22 gauge formed steel vertical stiffeners spaced not less than 6” o.c. and attached to face sheets by spot welds not less than 5” o.c. Vertical stiffeners at exterior door locations shall be galvannealed or hot dip galvanized. Voids between vertical stiffeners shall be filled with fiberglass batting.

G. Top and bottom edges closed with continuous recessed steel channels, of not less than 16 gauge, spot welded to both faces. Top edge of exterior doors sealed flush with welded in place closing channel to exclude water.

H. Overlapping steel astragals for pairs of labeled doors as required by manufacturer to meet codes.

I. Doors and frames are to be prepared to receive mortise type hardware and at hinge, lock, latch, and all other hardware locations, reinforcing plates shall be spot welded to the inner surface of the jambs. Hinge reinforcements shall not be less than 7 gauge steel. All top hinge reinforcements to incorporate manufacturer’s optional high frequency hinge reinforcement or full jamb depth hinge reinforcement. All other hardware reinforcements shall be not less than 12 gauge steel. Where door closers or brackets are to be installed, reinforcing plates shall be not less than 12 gauge steel. Twenty-four gauge galvanized steel plaster guards are to be spot welded over the hardware reinforcing plates. Provide 12 gauge reinforcement, for full height of door leaf, welded inside throat of frame to door rabbet wherever continuous geared hinges are scheduled. Provide 1/2” polystyrene, Celotex, or similar material, adhesive attached to the continuous hinge reinforcement inside the throat of the frame wherever continuous geared hinges are scheduled. Necessary holes for field installation of mortise type hardware shall be drilled and tapped from templates, which are to be furnished to the frame manufacturer by the hardware contractor. Provide suitable reinforcements for surface applied hardware, but no drilling or tapping is to be done at the factory for application of surface applied hardware. Prepare frames for silencers.

J. All glazing trim shall either be an integral part of the door face on the secure side with a removable bead flush with the opposite door face or metal glass light trim with a projection not to exceed 3/32” from either door face,

2.03 FULL AND TWO-LIGHT DOORS

A. Doors at interior locations shall be manufactured of cold rolled, or annealed steel. Doors must be of welded, seamless tubular stile and rail construction with all angles, tube intersections, molds, returns and miters neatly welded and all weld beads ground smooth for finishing. Visible seams on door faces are not acceptable.

B. Doors at exterior locations shall be manufactured of A60 galvannealed or G60 hot dipped galvanized steel. Doors must be of welded, seamless tubular stile and rail construction with all angles, tube intersections, molds, returns and miters neatly welded and all weld beads ground smooth for finishing. Visible seams on door faces are not acceptable.

C. Face sheets of 16 gauge steel. Voids in tubular members shall be filled with fiberglass batting.

D. Vertical stiles, top rail, and intermediate rail (if detailed) shall be of 6” nominal construction. Tubular construction of top rail shall provide a flush top surface to exclude water and moisture. Bottom rail shall be of 12” nominal construction.

2.04 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
   1. Core Material: Vertical steel stiffeners with fiberglass batts.
   2. Door Thickness: 1-3/4 inch, nominal.
   3. Top Closures: Flush with top of faces and edges.
   4. Weatherstripping: Refer to Section 08 7100.

B. Interior Doors, Non-Fire Rated:
   1. Door Core Material: Vertical steel stiffeners.
   2. Door Thickness: 1-3/4 inch, nominal.

C. Fire-Rated Doors:
   1. Fire Rating: As indicated on drawings, tested in accordance with UL 10C ("positive pressure").
      a. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
      b. Provide units listed and labeled by UL (Underwriters Laboratories) - UL (BMD).
      c. Attach fire rating label to each fire rated unit.
   2. Core Material: Vertical steel stiffeners.
   3. Door Thickness: 1-3/4 inch, nominal.

2.05 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
   3. All angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.
   4. Weatherstripping: Separate, see Section 08 7100.

C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 14 gage, 0.067 inch or 16 gage, 0.053 inch, minimum.

2. Three-sided frames for single doors up to and including 4’-0” in width shall be manufactured of 16 gauge steel. Frames for pairs of doors 6’-0” and over, all sidelight frames, and all borrowed light frames shall be manufactured of 14 gauge steel. All angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.

D. 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 or 16 gage, 0.053 inch, minimum.
3. Three-sided frames for single doors up to and including 4’-0” in width shall be manufactured of 16 gauge steel. Frames for pairs of doors 6’-0” and over, all sidelight frames, and all borrowed light frames shall be manufactured of 14 gauge steel. All angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.

E. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
1. All two-piece mullions shall be factory welded to form a single-piece, inseparable section before assembly into a frame unit.

F. Transom Bars: Fixed, of profile same as jamb and head.

2.06 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.07 ACCESSORIES

A. Louvers: Roll formed steel with concealed frame; finish same as door components ; factory-installed.
1. Style: Standard straight slat blade.
2. Fasteners: Exposed tamper proof fasteners.

B. Glazing: As specified in Section 08 8000.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered 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: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

G. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions. Omit silencers on exterior doors.

H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

I. For each jamb in masonry construction, provide 3 or more 16 gauge adjustable jamb anchors of the T-anchor type or of the wire masonry anchor type spaced not more than 30” apart.

J. For each jamb in steel stud construction, provide 3 or more 18 gauge drywall type jamb anchors.

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.

D. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

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. Install fire rated units in accordance with NFPA 80.

C. Where practicable, place frames prior to construction of enclosing walls and ceilings.

D. Set frames accurately into position, plumbed, aligned, and braced securely until permanent anchors are set.

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. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

H. At in-place construction, set frames and secure to adjacent construction with machine screws and suitable anchorage devices. Provide “Z” fillers at each screw location.

I. Fit and hang doors to maintain specified clearances. Metal hinge shims are acceptable to maintain clearances.

J. Install door hardware as specified in Section 08 7100.

K. Comply with glazing installation requirements of Section 08 8000.

L. Coordinate installation of electrical connections to electrical hardware items.

M. Immediately after erection, sand smooth all rusted and damaged areas of prime coat, and apply touch-up of compatible air-drying primer.

N. 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.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated, non-rated, and acoustical.

B. High pressure decorative laminate facing

1.02 RELATED REQUIREMENTS

A. Section 01 6210 - Schedule of Materials and Colors

B. Section 08 1113 - Hollow Metal Doors and Frames.

C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

B. ASTM E413 - Classification for Rating Sound Insulation; 2016.

C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

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

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door veneer, 6 by 6 inches in size illustrating wood grain, stain color, and sheen.

E. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

F. Samples: Submit three samples of door veneer, 6 by 6 inch in size illustrating plastic laminate pattern and color.

G. Manufacturer's Installation Instructions: Indicate special installation instructions.

H. Specimen warranty.

I. Warranty, executed in Owner's name.

J. Closeout Submittals
   1. Submit under provisions of Section 01 7800 – Closeout Submittals.
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
      a. All mastics, glues, and adhesives
      b. Sealant (interior use only)
      c. Fire doors (insulating material)

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than five years of documented experience.
   1. Company with at least one project within past five years with value of woodwork within at least 20 percent of cost of woodwork for this project.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

D. Certifications
   1. Fire Ratings Compliance: Fire-rated wood doors to comply with NFPA-80, Positive Pressure Testing UBC 7-2-97 and/or UL10C, and requirements according to building code standards having local jurisdiction.
   2. Label Certification: All doors requiring fire-rating shall carry either UL or ITS (Warnock Hersey) metal label stating:
      a. Name and Logo of Listing Agency
      b. Name of Door Manufacturer
      c. Compliance with UBC 7-2-97 and/or UL10C
      d. Temperature rise rating
      e. Compliance with “S” label and/or UL 1784 requirements at all 20-minute rated doors and elsewhere as required by the building code and/or the AHJ
      f. Hourly rating

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do not store on edge. Protect doors from dirt, water and abuse.

C. Accept doors on site in manufacturer's packaging, and inspect for damage.

D. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

E. Do not subject interior doors to extremes in either heat or humidity. HVAC systems should be operational and balanced, providing a temperature range of 50 to 90 degrees Fahrenheit and 30% to 50% relative humidity.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction, and repair or replacement of the door as originally furnished.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Substitutions: See Section 01 6000 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL) Faced Doors:
   1. AJW Architectural Products: www.ajw.com/#sle.
   2. Oregon Door: www.oregondoor.com/#sle.
   3. Masonite Architectural: www.architectural.masonite.com/#sle.
   4. Poncraft Door Co: www.poncraft.com/#sle.
   5. VT Industries, Inc: www.vtindustries.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.
   1. Quality Standard: Premium Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 5-ply, Grade A unless otherwise indicated.

3. High Pressure Decorative Laminate (HPDL) Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to ratings as indicated on drawings in accordance with ICC (IBC) - Positive Pressure; Underwriters Laboratories Inc. (UL) labeled.
   3. Sound Retardant Doors: Minimum STC of 45, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
   4. High pressure decorative laminate (HPDL) finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, or fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

C. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

A. High Pressure Decorative Laminate (HPDL) Facing for Fire Doors: NEMA LD 3, SGF; color as selected; See Section 01 6210, Schedule of Materials and Colors.

B. High Pressure Decorative Laminate (HPDL) Facing for Non-Fire-Rated Doors: NEMA LD 3, HGS; color as selected; See Section 01 6210, Schedule of Materials and Colors.

C. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at Lock edge, top of door for closer, and exit devices for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.
   3. Mineral core veneer doors should have a minimum of 1/2” stile on hinge edge of door. Veneer shall be 5 ply.

C. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Cut and configure exterior door edge to receive recessed weatherstripping devices.

G. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. See Section 01 6210 Schedule of Materials and Colors and Section 09 9000 Paintings and Coatings.

B. Finish doors in accordance with approved sample. Door color and finish shall be coordinated with the casework color and finish and approved by the Architect prior to fabrication.

C. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 1113.

B. Metal Louvers:
   1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.

C. Glazing: See Section 08 8000.

D. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamper proof screws.

E. Astragals for Fire-Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge, specifically for double doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 and ITS (DIR) requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

F. Install door louvers plumb and level.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling access door and frame units.

B. Floor access door and frame units, interior.

1.02 RELATED REQUIREMENTS

A. Section 09 9000 - Painting and Coating: Field paint finish.

1.03 REFERENCE STANDARDS

1.04 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.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate operation features, operation features, and operation features.

E. Project Record Documents: Record actual locations of each access unit.

F. Closeout Submittals
   1. Submit under provisions of Section 01 7800 – Closeout Submittals.
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
      a. All mastics, glues and adhesives
      b. Sealant (interior use only)
      c. Fire doors (insulating material)

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Material: Steel.
   2. Size: 24 by 24 inch, unless otherwise indicated.
      a. 10 x 10 inches at single valve access and at all roof drain locations on first floor.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   6. Plaster Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   7. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

B. Wall-Mounted Units in Wet Areas:

1. Material: Stainless steel.
2. Size: 24 by 24 inch, unless otherwise indicated.
3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
6. Plaster Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
7. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

C. Fire-Rated Wall-Mounted Units:
1. Wall Fire-Rating: As indicated on drawings.
2. Material: Steel.
3. Size: 24 by 24 inch, unless otherwise indicated.
4. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units:
1. Material: Steel.
2. Size in Other Ceilings: 24 by 24 inch, unless otherwise indicated.
3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

E. Fire-Rated Ceiling-Mounted Units:
1. Ceiling Fire-Rating: As indicated on drawings.
2. Material: Steel.
3. Size: 24 by 24 inch, unless otherwise indicated.
4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

F. Interior Floor-Mounted Access Units:
1. Location: As indicated on drawings.

2.02 FLOOR ACCESS UNITS

A. Manufacturers:
1. ACUDOR Products Inc: www.acudor.com.
2. Babcock-Davis: www.babcockdavis.com/sle.
3. Bilco Company: www.bilco.com/sle.
4. Cendrex, Inc: www.cendrex.com/sle.
5. Nystrom, Inc: www.nystrom.com/sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Interior Floor Access Units: Steel, minimum 1/4 inch thick.
1. Cover: 1/8 inch deep recess with edge molding.
2. Lift Handle: Removable.
3. Manufacturers: Basis of Design
a. Non-Fire Rated Units: Bilco, Model K-4
b. Fire Rated Units: Bilco, Model FR-4

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 3313
COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated aluminum coiling counter doors and operating hardware (Kitchen tray returns).

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

1.04 SUBMITTALS

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

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two slats, 4 inch long, illustrating shape, color and finish texture.

E. Manufacturer's Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.

F. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

1.05 QUALITY ASSURANCE

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace doors that fail in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Doors:
   1. C.H.I. Overhead Doors: www.chiohd.com/#sle.
   2. Clopay Building Products: www.clopaydoor.com/#sle.
   3. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
   4. Raynor Garage Doors: www.raynor.com/#sle.
   5. The Cookson Company: www.cooksondoor.com/#sle.
   6. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Coiling Counter Doors, Non-Fire-Rated: Aluminum slat curtain.
   1. Locations: Provide at Kitchen tray return counters.
   2. Mounting: Interior face mounted.
   3. Nominal Slat Size: 1-1/2 inches wide.
   4. Slat Profile: Flat.

5. Finish, Aluminum: Clear Anodized.
6. Guides: Extruded aluminum track; same finish unless otherwise indicated.
7. Hood Enclosure: Manufacturer's standard; aluminum.
   a. Provide mechanism cover for all exposed moving operator components.
   b. Finish, Aluminum: Clear Anodized.
8. Manual hand crank lift operation.
9. Locking Devices: Slide bolt on inside.

2.03 MATERIALS

A. Curtain Construction: Interlocking, single thickness slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with tube or steel angel to provide reinforcement and positive contact in closed position; vinyl astragal along bottom edge.
   3. Steel Slats: ASTM A653/A653M galvanized steel sheet, with minimum G90/Z275 coating; minimum thickness 22 gage, 0.03 inch.
   4. Aluminum Slats: ASTM B221 (ASTM B221M), aluminum alloy Type 6063; minimum thickness 0.04 inch.

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
   1. Guides for Galvanized Curtains: Extruded aluminum channel or bent steel shapes.
   2. Aluminum Guides: Extruded aluminum channel, with wool pile runners along inside.
   3. Finish: To match curtain.

C. Lock Hardware:
   1. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.

D. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 3323
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior non-fire-rated coiling doors.

B. Electric operators and control stations.

C. Wiring from electric circuit disconnect to operators and control stations.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Division 26 - Electrical

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ITS (DIR) - Directory of Listed Products; current edition.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA MG 1 - Motors and Generators; 2017.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL (DIR) - Online Certifications Directory; Current Edition.

H. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide general construction, electrical equipment, and component connections and details.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two slats, 3 by 6 inches in size illustrating shape, color and finish texture.

E. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience and approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace doors that fail in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Doors:
   1. C.H.I. Overhead Doors: www.chiohd.com/#sle.
   2. Clopay Building Products: www.clopaydoor.com/#sle.
   3. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
   4. Raynor Garage Doors: www.raynor.com/#sle.
   5. The Cookson Company: www.cooksondoor.com/#sle.
   6. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING DOORS

A. Interior Non-Fire-Rated Coiling Doors: Steel slat curtain.
   1. Single thickness slats.
   2. Nominal Slat Size: 2-1/2 inches wide by required length.
   3. Finish: Factory powder coated, color as selected. See Section 01 6210-Schedule of Materials and Colors.
   4. Guides, Angles: Powder coated to match curtain.
   5. Hood Enclosure: Manufacturer's standard; Powder coated to match curtain.
      a. Provide mechanism cover for all exposed moving operator components.
   6. Electric operation.
   7. Mounting: Surface mounted.

2.03 MATERIALS AND COMPONENTS

A. Metal Curtain Construction: Interlocking slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom for Slat Curtains: Fitted with angles or aluminum extrusions to provide reinforcement and positive contact in closed position.
   3. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and lintel brush seal where curtain enters hood enclosure of exterior doors.
   4. Steel Slats: Minimum thickness, 22 gauge, 0.03 inch; ASTM A653/A653M galvanized steel sheet. Provide 20 gauge slats where opening size dictates.
      a. Galvanizing: Minimum G60 coating.

B. Guides - Angle: ASTM A36/A36M metal angles, size as required for door configuration.

C. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
   1. Minimum thickness; 24 gauge, 0.024 inch.
   2. Powder coated to match curtain.
   3. Provide mechanism cover for all exposed moving operator components.

D. Lock Hardware:
   1. For motor operated units, additional lock or latching mechanisms are not required.

E. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide tamperproof operation cycle counter.

B. Electric Operators:
   1. Mounting: Front of Coil.
   2. Motor Enclosure:
      a. Interior Coil: NEMA MG 1, Type 1; totally enclosed fan cooled (TEFC).
   3. Motor Rating: Minimum 1/3 HP; industrial duty, or as required by the manufacturer.
   4. Motor Voltage: 120 volts, single phase, 60 Hz. minimum. Verify with electrical drawings.
   5. Controller Enclosure: NEMA 250, Type 1.
   6. Opening Speed: 8-9 inches per second.
   7. Brake: Manufacturer's standard type, activated by motor controller.
   8. Manual override in case of power failure.
   9. See Division 26 - Electrical for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard “Open/Close” key-operated, 'Open-Close-Stop' momentary-contact control device with small format Best type 7-pin cylinder, NEMA 1B for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb at CMU walls.
   3. Recess mounted, at interior door jamb at gypsum walls.
   4. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Division 26 Electrical.

F. Complete wiring from disconnect to unit components.

G. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 3326
OVERHEAD COILING GRILLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling metal grilles and operating hardware; electrically operated.

B. Wiring from electric circuit disconnect to operator and to control station.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Cylinder cores and keys.

B. Division 26 - Electrical

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA MG 1 - Motors and Generators; 2017.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide general construction component connections and details, and electrical equipment.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two grille members, 6 by 6 inch in size illustrating shape, color and finish texture.

E. Manufacturer's Installation Instructions: Indicate installation sequences and procedures, adjustment and alignment procedures.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience and approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Grilles:
   1. C.H.I. Overhead Doors: www.chiohd.com/#sle.

2. Clopay Building Products: www.clopaydoor.com/#sle.
3. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
4. The Cookson Company: www.cooksondoor.com/#sle.
5. Raynor Garage Doors: www.raynor.com/#sle.
6. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GRILLES AND COMPONENTS

A. Grille: Aluminum; horizontal bar curtain, coiling on overhead counterbalanced shaft.
   1. Electric operation.
   2. Mounting: Surface mounted.

B. Curtain: Round horizontal bars connected with vertical links to form a brick pattern.
   1. Horizontal bars: 5/16 inch diameter.
   2. Bar spacing: 2 inch on center.
   3. Tube spacers: 1/2 inch diameter.
   4. Spacer spacing: 9 inch on center.
   5. Vertical links: Minimum 5/8 by 1/8 inch flat bar.
   6. Link spacing: 9 inch on center.
   7. Bar Ends: End links to be held in place by self-locking retaining rings.
   8. Bottom Bar: Extruded aluminum tubular section with sensing edge seal/cushion.
   9. Finish: Anodized, Clear.

C. Guides: Extruded aluminum section, of profile to retain grille in place with snap-on trim, polypropylene pile runners on both sides of curtain for quiet operation and wall mounting angles of same metal.
   1. Finish: Anodized, Clear.

D. Hood Enclosure and Trim (for exposed coil housing conditions): Sheet metal; completely covering operating mechanisms; internally reinforced to maintain rigidity and shape.
   1. Material: Aluminum.
   2. Sheet Metal Thickness: 0.040 inch.
   3. Finish: Anodized, Clear.

E. Lock Hardware:
   1. Center mounted on bottom bar, keyed locking with Best 7 pin cylinders with removable key core, operable from both sides of grille with lock bars into both jambs, with motor interlock cutout switches.

F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.03 MATERIALS

A. Galvanized Steel Bars: Galvanized to minimum coating thickness grade in accordance with ASTM A123/A123M.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide tamperproof operation cycle counter.

B. Electric Operators:
   1. Mounting: Front of Coil.
   2. Motor Enclosure:
      a. Interior Coiling Grilles: NEMA MG 1, Type 1; totally enclosed fan cooled (TEFC).
   3. Motor Rating: 1/3 hp; industrial duty, or as required by the manufacturer.

4. Motor Voltage: 120 volts, single phase, 60 Hz. Verify with electrical drawings.
5. Controller Enclosure: NEMA 250 Type 1.
6. Opening Speed: 8-9 inches per second.
7. Brake: Manufacturer's standard type, activated by motor controller.
8. Integral motor mounted interlock sensing to prevent damage to grille and operator when mechanical locking devices are engaged.
9. Manual override in case of power failure.
10. See Division 26 - Electrical for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard “Open/Close” key-operated "Open-Close-Stop" momentary-contact control device with small format Best type 7-pin cylinder, NEMA 1B for each operator complying with UL 325.
1. 24 volt circuit.
2. Surface mounted, at interior door jamb at CMU walls.
3. Recess mounted, at interior door jamb at gypsum walls.
4. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install grille unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Division 26 Electrical.

F. Complete wiring from disconnect to unit components.

G. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust grille, hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean grille and components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 3906
TORNADO RESISTANT DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tornado Shelter Steel Doors.

B. Tornado Shelter Steel Frames.

1.02 RELATED REQUIREMENTS

A. The Contract Documents, as defined in the General Conditions and modifications thereto, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

B. Related Sections:
   1. Section 01 1400 – Work Restrictions: Work restrictions related to the Tornado Shelter
   2. Section 03 1119 - Insulating Concrete Forms
   3. Section 04 2000 - Unit Masonry
   4. Section 08 7100 - Door Hardware
   5. Section 09 9000 - Paints and Coatings

1.03 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames.
   2. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

B. American Society for Testing and Materials (ASTM):
   1. ASTM A 336 - Standard Specification for Commercial Steel (CS) Sheet, Carbon (0.15 Maximum Percent) Cold-Rolled.
   2. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ICC/NSSA Standard for the Design and Construction of Storm Shelters:
   1. ICC 500 American National Standard 2014

D. National Association of Architectural Metal Manufacturers (NAAMM):
   1. NAAMM HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers.

1.04 SYSTEM DESCRIPTION

A. Tornado shelter storm doors, frames and hardware shall be provided as an integral ICC 500-2014 Tested and Certified assembly from a single supplier and installed by a single installer

B. Design Requirements:
   1. Shelter entry doors and frames shall resist design wind pressures for components and cladding as described in Section 1 and Missile Impact Loads of Section 2 of “National Performance Criteria for Tornado Shelters Federal Emergency Management Agency Mitigation Directorate”, latest edition. Only single opening and paired opening doors, and frames that can resist calculated design wind pressures and laboratory tested missile impacts are acceptable.
   2. All doors shall have sufficient points of connection to frame to resist design wind pressure and impact loads. All doors will be attached to the frame per the door hardware that the door and frame were tested with.

3. Protective missile resistant barrier is permitted to protect door opening. Design door to resist wind pressures. Size and number of shelter doors shall be determined in accordance with applicable fire safety and building codes.
4. Door systems, both single doors and paired openings, shall be tested and must comply with ICC 500, and have verifiable third party conformance test results and be certified by a Nationally Recognized Independent Testing Laboratory such as Underwriter's Laboratories (UL). or Warknock Hersey (ITS).

1.05 SUBMITTALS

A. Section 01 3000 - Submittal Procedures: Requirements for submittals.
   1. Product Data:
      a. Doors and Frames: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
      b. Hardware: Manufacturer's technical product data for each item of hardware. Include information necessary to show compliance with requirements, and include instructions for installation and maintenance of operating parts and finishes.
   2. Hardware Schedule: Submit hardware schedule for tornado shelter storm door hardware groups indicated in this Section.
   3. Shop Drawings: Details of each opening, showing elevations and frame openings. Show provisions for hardware conforming to ICC 500 requirements.
   4. Quality Assurance/Control Submittals:
      a. Independent Tests: Complete door, frame and hardware assembly shall have been tested and certified by Underwriter's Laboratories (UL) for compliance with ICC 500 requirements.
      b. Test Reports: Report for design wind pressure and missile impact tests in accordance with National Performance Criteria for Tornado Shelters Federal Emergency Management Agency Mitigation Directorate, latest edition.
      c. Certificates: Manufacturer's certificate that Products meet or exceed specified ICC-500 requirements.
      d. Qualification Documentation: Upon request, submit documentation of experience indicating compliance with specified qualification requirements.

B. Section 01 7800 - Closeout Submittals: Procedures for closeout submittals.
   1. Warranty: Submit written warranty with forms complete in Owner's name and registered with manufacturer as specified in this Section.
   2. Door Hardware Inspection Report: Upon request, submit inspection report by AHC certifying that door hardware has been installed in accordance with manufacturer's instructions, has been adjusted and is functioning properly.
   3. Installation Certification: Submit written certification of installation on form provided.

1.06 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing the products ICC 500 storm doors and hardware as specified in this section with minimum five years documented experience.

B. Regulatory Requirements:
   1. Tornado Shelter Door and Frame Construction: Conform to ICC 500.
   2. Fire Door and Frame Construction: Conform to NFPA 252.
      a. Listed and labeled by UL as suitable to for the purpose specified and indicated.
      b. Listed and labeled as conforming to UL 10C.

C. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

D. Manufacturer Installation Instructions: Contractor shall maintain current copy of tornado shelter storm door, frame and hardware manufacturer published installation instructions and ICC 500 requirements in Project Field Office and refer to installation instructions at all times during installation.

E. Severe Storm Shelter Openings: Provide complete door systems for tornado resistant storm shelters and other areas of refuge complying and tested according to ICC 500, ICC/NSSA Standard for the Design and Construction of Storm Shelters.

F. Each door and frame will have its own permanent label showing what criteria the door and frame was tested in accordance with. The label will show what independent laboratory tested this assembly. The label will show test pressures both positive and negative in pounds per square foot, and the design pressure both positive and negative,

G. Single Source for all door hardware is required. Door Hardware that is supplied under sections 08 3906, 08 7100, and 28 1300 can be supplied under separate contracts but must all originate from the same manufacturer. No exceptions

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 6000 - Product Requirements: Transport, handle, store, and protect Products.

B. Deliver doors in manufacturer's standard labeled protective packaging.

C. Accept Products on site in manufacturer's packaging. Inspect for damage. Return damaged Products and replace with undamaged Products.

D. Project Field Superintendent shall inspect Products immediately upon delivery to Project Site, determine Product conformance with specified requirements and reject Products not complying with specifications. Project Field Superintendent shall direct that non-complying Products be removed from Project Site immediately.

E. Store in accordance with NAAMM HMMA 840.

F. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

1.08 COORDINATION

A. Coordinate the work with door opening construction, door frames and door hardware installation.

1.09 WARRANTY

A. Section 01 7800 - Closeout Submittals: Procedures for closeout submittals.

B. Manufacturer Warranty: Provide one (1) year manufacturer warranty for defects in material and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Source for Furnishing and Installation: Tornado shelter doors, frames and hardware shall be furnished by tornado shelter door, frame and hardware supplier. Installer must be approved by the door, frame and hardware supplier.

B. Doors and Frames:
   1. Steelcraft Paladin www.steelcraft.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

C. Section 01 6000 - Product Requirements: Product options and substitutions: Substitutions: Permitted. Only manufacturers that can provide doors, frames and hardware as an integral ICC 500 Tested and Certified assembly may submit for consideration as a substitute manufacturer.

2.02 TORNADO SHELTER DOORS AND FRAMES

A. Model:

1. Steelcraft: Paladin PW14
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Interior Door and Frame Material: ASTM A 366 cold-rolled carbon steel sheet, 16 gage, primed, ready for field painting.

C. Pairs of Doors: Provide pairs of doors certified without use of center mullion. Removable center mullion permitted, no center mullion preferred.

D. Exterior Door and Frame Material: ASTM A 653 steel sheet, zinc-coated galvanized, 16 or14 gage per manufacturers tested and approved assemblies, ready for field painting.

E. Door Core: As required by ICC 500.

F. Door Opening Size: As indicated on Door Schedule. Field measure and verify dimensions of doorframe openings.

G. Interior Fire Rated Doors: Provide units listed and labeled by UL.
1. Fire Rating: Indicated in Door Schedule.
2. Fire Testing: UL 10C for positive pressure, smoke and draft requirements.
3. Temperature Rise: Maximum 450 degrees F.

2.03 DOOR FINISH

A. Galvanizing: All components hot-dipped zinc-iron alloy coated (galvannealed) in accordance with ASTM A 653, with manufacturer’s standard coating thickness.

B. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

C. Field paint as specified in Section 09 9000 - Painting and Coating, color selected by Architect. More than one color may be selected.

2.04 DOOR HARDWARE

A. Hardware: See Section 08 7100-Door Hardware for products and hardware sets.

B. Section 01 6200 - Product Options: Product options and substitutions: Substitutions: Permitted. Only manufacturers that can provide doors, frames and hardware as an integral ICC 500 Tested and Certified assembly may submit for consideration as a substitute manufacturer.

C. Tornado Resistance Compliance: Conventional exit devices and tube steel removable mullions to be U.L. listed for windstorm components where applicable. Provide the appropriate tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

D. Multi-Point Exit Devices for Severe Storm Shelters Openings: Multi-point exit devices specifically engineered for out-swinging door applications on tornado resistant safe shelter rooms. Extra heavy duty steel component construction with each of the latching points automatically activated when the device is locked. The multi-point exit device is approved for usage as part of a complete ICC 500 door, frame and hardware assembly.

E. Multi-Point Locksets, Security: Three-point locking system device engineered for in-swinging door applications on windstorm safe shelter rooms. Extra heavy duty steel component construction securing the door to the frame at top, bottom and center latch positions. All three latching points are automatically activated when the device is locked.

F. Hinges, Template Hinges: Provide only template hinges which conform to ANSI A156.7.
1. Hinges approved for usage as part of a complete ICC 500 door, frame and hardware assembly.

G. Continuous Pinned Hinges:
1. Continuous Pinned hinges to be supplied with stainless steel screws

H. Door Closers; Approved for usage as part of a complete ICC 500 door, frame and hardware assembly.

I. Cylinders and Keying: Keyed cylinders are provided by Section 087100

J. Tornado shelter storm door hardware shall be furnished and installed by tornado shelter storm door supplier.

2.05 HARDWARE LOCATIONS AND REINFORCEMENTS

A. Locate hardware on doors and frames in accordance with the system manufacturer's specific location.

B. Hardware reinforcements are to be in accordance with the minimum standard gages as listed in SDI-100 and ICC 500 requirements.

C. Doors shall be mortised, reinforced and function holes provided at the factory in accordance with the hardware schedule and templates provided by the hardware supplier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 7000 - Execution and Closeout Requirements: verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify existing conditions and door frame opening dimensions before starting work.
   2. Verify that door opening sizes and tolerances are acceptable.
   3. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 INSTALLATION

A. Important note regarding sequencing of construction: The Contractor shall form the openings in the precast concrete construction to be no more than 1/8" larger than the physical size of the door frames ordered and then hand grind the concrete as needed when installing the door frame so that no gap between the component and the precast concrete exceeds 1/4". Furthermore, the doors shall not be ordered until the frames and bottom strikes have been installed and the Contractor field measures the dimensions needed for each storm door.

B. Install doors in metal door frames in accordance with manufacturer's published instructions and requirements of ICC 500.

C. Install fire-rated doors in conformance with code requirements for compliance with NFPA 80 and UL 10C.

D. Coordinate installation of doors with installation of frames and hardware.

E. Install hardware in accordance with manufacturer's published instructions and requirements of ICC 500.

F. Use templates provided by hardware item manufacturer.

3.03 FIELD QUALITY CONTROL

A. Section 01 4533 – Code Required Quality Control: Contractor Quality Control Representative shall perform contractor quality control inspections.
   1. Inspect door installation, fit and clearance. Verify required ICC 500 label.
   2. Inspect fire door label for specified fire test ratings and requirements.

3. Inspect door hardware installation and operation for conformance with ICC 500 requirements.
4. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
5. Test and Inspection Reports shall be available to Architect upon request.

B. Hardware Supplier Field Services: At completion of hardware installation provide an Architectural Hardware Consultant (AHC) to inspect tornado shelter storm door hardware installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's installation instructions and ICC 500 requirements.

C. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

3.04 ADJUSTING CLEANING

A. Adjust for smooth and balanced door movement.

B. Adjust closers for full closure.

C. Clean doors, frames and hardware immediately after installation.

D. Clean doors and frames and polish door hardware just before Substantial Completion Inspection.

3.05 HARDWARE SCHEDULES

A. See Section 08 7100-Door Hardware for products and hardware sets.

TORNADO SHELTER DOORS, FRAMES & HARDWARE INSTALLATION CERTIFICATION

PROJECT:

LOCATION:

ARCHITECT'S PROJECT NUMBER:

OWNER:

CONTRACTOR: _____

DOOR, FRAME & HARDWARE INSTALLER:

Name: _____

Address: _____

Telephone Number: _____

UPON COMPLETION OF INSTALLATION INSTALLER CERTIFIES THAT:

A. Installer obtained a current copy of the manufacturer's published installation instructions and ICC 500 requirements for the specific doors, frames and hardware being installed.

B. Installer reviewed and discussed manufacturer's published installation instructions and FEMA ICC 500 requirements with Project Field Superintendent before start of installation.

C. Installer furnished and installed specified tornado shelter doors, frames and hardware in accordance with the Contract Documents.

D. Installer installed tornado shelter doors, frames and hardware in conformance with door, frame and hardware manufacturer's published installation instructions and ICC 500 requirements.

E. Installer provided door hardware inspection by an AHC and submitted Door Hardware Inspection Report as required by the Contract Documents.

EXECUTED AND DELIVERED this _____ day of _____, 20___ .

_____

(Company name)

BY: _____

(Authorized signature)

Subscribed and sworn to before me this _____day of _____, 20___.

_____

Notary Public

_____

My Commission expires: Affix Seal

END OF SECTION

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

B. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

F. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

H. 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).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting two weeks before starting work of this section; require attendance by all affected installers.

1.05 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, door hardware, 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. Samples: Accompanying the Shop Drawings, submit:
   1. Sample of each exposed member.
   2. Samples of finish, showing complete range of color from darkest to lightest proposed for use on this Work.
   3. Samples, when approved by the Architect, will be used to verify that the installed finish is within the approved range.

E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Texas.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 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.

1.08 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. Provide two year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide two year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING (EXTERIOR)

A. Center-Set Style, Thermally-Broken:
   1. Basis of Design: Kawneer Company Inc; Trifab VG 451T Storefront System.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. Arcadia, Inc.: www.arcadiainc.com
   2. Columbia Commercial Building Products: ccbpwin.com.
   3. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
   4. EFCO, a Pella Company: www.efcocorp.com/sle.
   5. Kawneer Company, Inc.: www.kawneer.com.
   6. Manko Window Systems, Inc.: www.mankowindows.com.
   7. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
   8. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
   9. Tubelite, Inc.: www.tubeliteinc.com
   10. YKK AP America Inc: www.ykkap.com.

2.02 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING (INTERIOR)

A. Center-Set Style:

1. Basis of Design: Kawneer Company Inc; Trifab VG 451 Storefront System.
2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
1. Arcadia, Inc.: www.arcadiainc.com
2. Columbia Commercial Building Products: ccbpwin.com.
3. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
4. EFCO, a Pella Company: www.efcocorp.com/sle.
5. Kawneer Company, Inc.: www.kawneer.com.
6. Manko Window Systems, Inc.: www.mankowindows.com.
7. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
8. Trulite Glass and Aluminum Solutions, LLC: www.trulite.com.
9. Tubelite, Inc.: www.tubeliteinc.com
10. YKK AP America Inc: www.ykkap.com.

2.03 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Not Thermally-Broken:
1. Basis of Design: Kawneer Company Inc; 500 Heavy Wall Entrance Door.
2. Thickness: 2 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
1. Arcadia, Inc.: www.arcadiainc.com
2. Columbia Commercial Building Products: ccbpwin.com.
3. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
4. EFCO, a Pella Company: www.efcocorp.com/sle.
5. Kawneer Company, Inc.: www.kawneer.com.
6. Manko Window Systems, Inc.: www.mankowindows.com.
7. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
8. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
9. Tubelite, Inc.: www.tubeliteinc.com
10. YKK AP America Inc: www.ykkap.com.

2.04 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
1. Finish: Refer to Section 01 6210 - Schedule of Materials and Colors
   a. Factory finish all surfaces that will be exposed in completed assemblies.
   b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
2. Finish Color: Refer to Section 01 6210-Schedule of Materials and Colors
3. 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.
4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
5. 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.
6. 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.

7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
10. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Performance Requirements:
1. General Requirements
   a. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
   b. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
   c. Provide concealed fastening.
   d. Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
   e. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
   f. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
   g. Provide for expansion and contraction without detriment to appearance or performance.
   h. Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
   i. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.
   j. Coordinate all door hardware with Section 08 7100 – Door Hardware.
2. Frame calculations shall be designed by a registered engineer in the State of Texas. Manufacturer is responsible for system reinforcing.
3. 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.
4. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
5. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.
6. Thermal Requirements:
   a. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180º F without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
   b. Ensure doors function normally within limits of specified temperature range.
   c. Thermal Break with a 1/4" separation consisting of a two part chemically curing, high density polyurethane which is mechanically and adhesively joined to aluminum storefront sections.

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.
   3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: As specified in Section 08 8000.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

C. Internal Reinforcing:
   1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
   2. Shapes and sizes to suit installation.
   3. Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.

D. Anchorage Devices:
   1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.

E. Fasteners:
   1. Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
   2. Do not use exposed fasteners, except where unavoidable for application of hardware.
   3. For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
   4. For concealed locations, provide manufacturer's standard fasteners.
   5. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.

F. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Gaskets:
   1. Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).
   2. Conform to ASTM C509 or C864.
   3. Profile and hardness as required to maintain uniform pressure for watertight seal.
   4. Provide in manufacturer's standard black color.

I. Weatherstripping:
   1. Wool pile conforming to AAMA 701.2; or extruded EPDM elastomeric conforming to ASTM C509 or C864.
   2. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

J. "Anti-Walk" Edge Blocking: "W" shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.

K. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.

L. Glazing Accessories: As specified in Section 08 8000.

M. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.07 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.08 FABRICATION

A. Coordination of Fabrication:
1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
2. Fabricate units to withstand loads which will be applied when system is in place.

B. General:
1. Conceal fasteners wherever possible.
2. Reinforce work as necessary for performance requirements and for support to structure.
3. Comply with Section 08 8000 for glazing requirements.

C. Aluminum Framing:
1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
2. Fabricate frame assemblies with joints straight and tight fitting.
3. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
4. Seal horizontals and direct moisture accumulation to exterior.
5. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
6. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
7. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer.
8. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.
9. Provide thermally broken aluminum backer plate at perimeter of all windows and individual aluminum caps at the top of all vertical window frame mullions.
10. Provide fully soldered end dams at ends of subsill system.

D. Entrance Doors:
1. Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
2. Provide extruded aluminum glazing stops of square design, permanently anchored on security side and removable on opposite side.

E. Welding:
1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

F. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor 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 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 operating sash.

J. Set thresholds in bed of sealant and secure.

K. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

L. 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. See Section 01 4000 - Quality Requirements, for general testing and inspection requirements.

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 indicated on drawings.
2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

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.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4413
GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing and glass infill panels.

1.02 RELATED REQUIREMENTS

A. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

E. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2018.

F. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

1.04 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.

1.05 SUBMITTALS

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

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

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.

D. Samples: Accompanying the Shop Drawings, submit:
   1. Sample of each exposed member.
   2. Samples of finish, showing complete range of color from darkest to lightest proposed for use on this Work.
   3. Samples, when approved by the Architect, will be used to verify that the installed finish is within the approved range.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at Texas.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 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.

1.08 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.

1.09 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. Provide two year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide two year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN

A. Pressure Cap Four Sides; Not Unitized, Field Assembled:
   1. Basis of Design: Kawneer Company Inc; 1600 Curtain Wall System.

B. Other Manufacturers: Provide either product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below.
   1. Arcadia, Inc.: www.arcadiainc.com
   2. Columbia Commercial Building Products: ccbpwin.com
   3. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com.
   4. EFCO, a Pella Company: www.efcocorp.com/sle.
   5. Kawneer Company, Inc.: www.kawneer.com
   6. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
   7. Manko Window Systems, Inc.: www.mankowindows.com
   8. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
   9. Tubelite, Inc.: www.tubeliteinc.com
   10. YKK AP America Inc: www.ykkap.com.

2.02 BASIS OF DESIGN - SWINGING DOORS

A. Wide Stile, Insulating Glazing, Not Thermally-Broken:
   1. Basis of Design: Kawneer Company Inc; 500 Heavy Wall Entrance Door.
   2. Thickness: 2 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. Arcadia, Inc.: www.arcadiainc.com

2. Columbia Commercial Building Products: ccbpwin.com
3. C.R. Laurence Co., Inc; U.S. Aluminum: www.crl-arch.com.
4. EFCO, a Pella Company: www.efcocorp.com.
5. Kawneer Company, Inc.: www.kawneer.com
6. Manko Window Systems, Inc.: www.mankowindows.com
7. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
8. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
9. Tubelite, Inc.: www.tubeliteinc.com
10. YKK AP America Inc.: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.03 CURTAIN WALL

A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Fabrication Method: Either shop/factory or field fabricated system.
   2. Glazing Method: Either shop/factory or field glazed system.
   3. Mullion Dimensions: 2-1/2 inches by depth as required by engineered drawings for structural performance.
   4. Finish: Class I natural anodized.
      a. Factory finish surfaces that will be exposed in completed assemblies.
      b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   5. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. 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.
   8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   9. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
   1. Design Wind Loads: Comply with the applicable code.
   2. Movement: Accommodate the following movement without damage to components or deterioration of seals:
      a. Expansion and contraction caused by 180 degrees F surface temperature.
      b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
      c. Movement of curtain wall relative to perimeter framing.
      d. Deflection of structural support framing, under permanent and dynamic loads.

C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
   1. Test Pressure Differential: 12 psf.
   2. Test Method: AAMA 501.1.

D. Air Leakage: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.24 psf pressure differential across assembly.

E. Thermal Performance Requirements:

1. Condensation Resistance Factor of Framing: 71, minimum, measured in accordance with AAMA 1503.
2. Overall U-value Including Glazing: 0.46 Btu/(hr sq ft deg F), maximum.

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. Framing members for interior applications need not be thermally broken.

B. Glazing: As specified in Section 08 8000.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

C. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.

D. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.

E. Firestopping: As specified in Section 07 8400.

F. Weatherseal Sealant: Silicone, with adhesion in compliance with ASTM C794; compatible with glazing accessories.

G. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, and compatible with flashing material.

H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

I. Glazing Accessories: As specified in Section 08 8000.

J. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

K. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.07 FABRICATION

A. Coordination of Fabrication:
   1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
   2. Fabricate units to withstand loads which will be applied when system is in place.

B. General:
   1. Conceal fasteners wherever possible.
   2. Reinforce work as necessary for performance requirements and for support to structure.
   3. Comply with Section 08 8000 for glazing requirements.

C. Aluminum Framing:
   1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
   2. Fabricate frame assemblies with joints straight and tight fitting.
   3. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
   4. Seal horizontals and direct moisture accumulation to exterior.

5. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
6. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
7. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer.
8. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.
9. Provide thermally broken aluminum backer plate at perimeter of all windows and individual aluminum caps at the top of all vertical window frame mullions.
10. Provide fully soldered end dams at ends of subsill system.

D. Entrance Doors:
1. Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
2. Provide extruded aluminum glazing stops of square design, permanently anchored on security side and removable on opposite side.

E. Welding:
1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

F. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.08 HARDWARE

A. Receive hardware supplied in accordance with Section 08 7100 – Door Hardware and install in accordance with requirements of this Section.

B. Cut, reinforce, drill and tap frames and doors as required to receive hardware.

C. Comply with hardware manufacturer's templates and instructions.

D. Use concealed fasteners wherever possible.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other related work.

B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install curtain 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 flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Install firestopping at each floor slab edge.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Pressure Plate Framing: Install glazing and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

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 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 01 4000 - Quality Requirements, for general testing and inspection requirements.

C. Water-Spray Test: Provide water spray quality test of installed curtain wall components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.

3.05 ADJUSTING

A. Adjust operating sash for smooth operation.

3.06 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, take care to remove dirt from corners, and wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 - GENERAL

1.01 WORK INCLUDED

The work in this section shall include the furnishing of all items of door hardware as hereinafter specified, or obviously necessary to complete the building, except those items which are specifically excluded from this section of the specification.

1.02 DESCRIPTION OF WORK

Door Hardware - Hardware used in building construction but particularly that used on or in connection with doors and frames, cabinets and other movable members. It also has a finished appearance as well as functional purpose and may be considered as a part of the decorative treatment of a room or building.

1.03 RELATED WORK

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.

B. Related Sections:

Section 081000 - Steel Doors and Frames
Section 081000 – Standard Steel Frames
Section 082100 – Flush Wood Doors
Section 082120 – Stile and Rail Wood Doors
Section 082150 – Plastic Faced Wood Doors
Section 083300 - Coiling Doors and Grilles

1.04 QUALITY ASSURANCE

A. Hardware has been specified herein by manufacturer's name, brand and catalog numbers for the purpose of establishing a basis for quality, finish, design and operational function. To insure a uniform basis of acceptable material, it is the intention that only manufacturer's items specified as "Acceptable and Approved" be furnished for use on this project.

B. *Substitutions:* Request for substitutions of items of hardware not listed as "Acceptable and Approved" shall be made to the Architect no later than ten (10) days prior to bid opening. Approval of substitutions will only be in writing or by addenda. Request for substitutions shall be accompanied by samples and/or detailed information as to the manufacturer of the product.

C. *Underwriters' Laboratories Requirements:* Hardware for openings classed as requiring a UL label in the door schedule, or by code, shall be furnished and installed to meet the applicable requirements of NFPA 80. Hardware shall be UL listed for usage with types and sizes of fire doors specified and scheduled. Products tested shall meet requirements of UBC 7-2-1997 / UL10C

D. *Accessibility Standards:* Hardware shall be in conformance with Article 9102, Texas Civil Statutes, Elimination of Architectural Barriers Act of Texas.

1. Door Closers: The sweep period of closers shall be adjusted so that from an open position of 90 degrees, the door will take at least five seconds to move to an open position of approximately 12 degrees.

2. The maximum force for pushing or pulling open door shall be as follows:
   a. Exterior hinged doors: Not to exceed 8.5 lbf.
   b. Sliding, folding, and interior hinged doors: Not to exceed 5 lbf.
   c. Fire doors: Adjusted to meet minimum closing force permitted by governing fire safety standards.

E. *Federal Accessibility Standards:* Hardware shall be in accordance will all requirements of the Americans With Disabilities Act - 1990.

F. *Supplier:* A recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than two (2) years, and who is, or has in employment, a Hardware Consultant (AHC) in good standing as certified by the Door and Hardware Institute. This consultant shall have experience in the preparation of architectural hardware specifications, estimating, detailing, ordering, servicing of architectural hardware in all its branches and will be available at reasonable times during the course of the work for project hardware consultation to the Owner, Architect and Contractor. It is the hardware distributor's responsibility to coordinate the hardware specified to work with the Aluminum doors.

G. *Pre-Installation Instructional Meeting:* Contractor shall schedule and hold a pre-installation meeting that includes the Contractor, the Architect and/or his chosen representative, the Hardware Supplier, and all installers of hardware. Instructional meeting shall be conducted by the Hardware Supplier, covering proper installation of all items of hardware to be incorporated into the Project.

H. *Installer:* Firm with a minimum of five years of documented experience in installing the types and grade of hardware being incorporated into the Project. Three written references from Construction Administrators of previous projects required for the Architect's review before installation Contract or Subcontract is executed.

I. Prototype Installations: One of each type of the following hardware installations shall be performed to the Architect's (and/or his designated representative's) approval before any installations of like-type applications are performed:

1. One exterior door pair with exit devices

2. One exterior single door with an exit device

3. One single classroom door

4. One interior pair of doors with vertical rod exit devices

1.05 REFERENCES

A. Door Hardware in this section shall meet the following as established by the American National Standards Institute, Inc. (ANSI) which is sponsored by the Builders Hardware Manufacturers Association, Inc., (BHMA). Product tests are to be administered by the ETL Testing Laboratories, Inc., or other official testing laboratories which have been designed by BHMA for the testing of ANSI standards latest revision will be in effect.

B. Materials and Finishes BHMA 1301

Butts and Hinges	ANSI A156.1
Locks and Lock Trim	ANSI A156.2
Exit Devices	ANSI A156.3
Door Controls-Closers	ANSI A156.4
Auxiliary Lock & Assoc. Products	ANSI A156.5
Architectural Door Trim	ANSI A156.6
Template Hinge Dimensions	ANSI A156.7
Door Controls-Overhead Holders	ANSI A156.8
Mortise Locks and Latches	ANSI A156.13

C. *Listed Hardware:* Hardware which is to be installed in or on fire labeled doors and frames, Class A or lesser, single or pairs shall be tested and listed by Underwriters Laboratories and/or Warnock Hersey Fire Laboratories Division. Exit devices which are to be used as panic hardware shall be tested and listed in Underwriters Laboratories "Accident Equipment List-Panic Hardware". All listed hardware shall be in compliance with National Fire Protection Association (NFPA) Standard Number 80 UBC 1997, and IBC 2000 and be properly stamped or labeled for easy identification.

1.06 SUBMITTALS

A. The door hardware supplier shall, after award of a formal contract, submit to the Architect, six (6) complete typewritten copies of the proposed Door Hardware Schedule for approval. This schedule shall be prepared using the "Sequence and Format for the Hardware Schedule" as approved and recommended by the Door and Hardware Institute (DHI).

B. When submitting schedules for approval, include six (6) copies of cut sheets on each hardware item proposed. Index it with the use of number or letters or a combination of both, with the hardware schedule. The index numbers/letters are to be in the right hand column on the same line as the respective manufacturer's numbers shall be indexed even when appearing more than once.

C. *Samples:* As part of this contract, if requested, the hardware supplier shall provide the Architect with one sample of each item of door hardware that is to be furnished for this project.

D. *Templates:* The hardware supplier shall provide necessary templates and/or physical hardware to all trades requiring them in order that they may cut, reinforce or otherwise prepare their material or product to receive the hardware item. If physical hardware is required by any manufacturer, the hardware supplier shall ship to them such hardware via prepaid freight in sufficient time to prevent any delay in the execution of their work.

E. Submit Material Safety Data Sheets under provisions of Section 01780 for the following items:
   1. Fire doors (insulating material)

1.07 DELIVERY, STORAGE AND HANDLING

A. All items of hardware to be delivered to the jobsite shall be completely packaged with all necessary screws, bolts, miscellaneous parts, instructions and where necessary installation

templates for manufacturer's suggested installation. They are to be clearly labeled as to conveniently identify them and their intended location in the building.

B. A representative of the General Contractor shall receive the hardware when delivered at the jobsite. A dry locked storage space complete with shelving, shall be set aside for the purpose of unpacking, sorting out, checking and storage.

C. Door Hardware shall be delivered to the General Contractor by the hardware supplier. Direct factory shipments to the jobsite are not acceptable.

D. The hardware shall be jointly inventoried by representatives of the General Contractor and the Hardware Supplier.

E. Items damaged in shipment shall be replaced promptly and with proper material without additional cost to the General Contractor.

F. All hardware shall be handled in a manner to minimize marring, scratching or damage.

G. Store and handle all materials strictly according to the manufacturer's instructions.

1.08 WARRANTY

Door Closers shall carry a limited warranty against defects in workmanship and operation for a period of five (5) years from the date of acceptance. The balance of door hardware shall carry a limited warranty against defects in workmanship and operation for a period of one (1) year from date of acceptance. No liability is to be assumed where damage or faulty operation is due to abuse, improper usage, improper installation or failure to exercise normal maintenance.

PART 2 - PRODUCTS

2.01 FINISH OF HARDWARE

A. Finish of items shall be as specified under the door hardware sets of this section.

B. The finish of items not specially mentioned above nor set forth in the schedule shall be US26D, unless shown otherwise.

2.02 HINGES AND PIVOTS

A. *Template Hinges:* Provide only template hinges which conform to ANSI A156.7.

B. Use concealed bearing or five-knuckle ball bearing hinges, as indicated in the hardware sets, on heavy doors, doors where high frequency service is expected, doors equipped with door closers, and all labeled doors. (Oil impregnated bearing hinges are not acceptable.)

C. All hinges to be used on exterior doors or doors subject to special atmospheric conditions, (pool areas, chemical laboratories, sewage disposal plants, etc.) shall be of non-ferrous material, brass, bronze or stainless steel.

D. Hinge pins, except as otherwise indicated, shall be as follows:

1. Steel hinges: Steel pins
2. Non-ferrous hinges: Stainless steel pins
3. Exterior doors: Non-removable pins (NRP)
4. Out-swing corridor doors: Non-removable pins(NRP)
5. Interior doors: Non-rising pins

E. Sizes of hinges shall be as follows:

Door Thickness and Width	Hinge Height	Hinge Width
1 3/4" to 36"	4½	4 or 4½
1 3/4" over 36"		Continuous Hinge

F. Number of hinges per door, provided quantities as follows:

For doors less than 5 feet high: 1 pair
For doors 5 feet to 7 feet 6 inches high: 1 1/2 pair and additional hinge for each additional 2 1/2 feet or fraction thereof.

G. Where projection of door trim is such as to prevent degree of opening, the proper hinge width shall be provided to allow the door to clear the trim.

H. Provided above criteria is met, Acceptable and Approved as follows:

Bommer
Ives
Hager
McKinney

I. Continuous Hinges shall be type scheduled with edge protection and as manufactured by one of the following. Coordinate hinge type with Aluminum door supplier.

ABH Manufacturing
Ives
Hager

2.03 LOCKSETS

A. Locks shall have all functions available in one size case, manufactured from heavy gauge steel, minimum thickness of 3/32", complete chrome plated for corrosion resistance and lubricity of parts. Cases are to be closed on all sides to protect internal parts. Locks are to have adjustable, beveled and armored fronts, standard 2 3/4" backset, a full 3/4" throw two-piece mechanical anti-friction latchbolt, a one-piece stainless steel 1" throw deadbolt, and shall be available for a minimum door thickness of 1 3/8". Internal parts shall be heavy gauge steel, zinc dichromate plated for corrosion resistance.

B. All locksets with latchbolts, regardless of trim, shall be listed by Underwriters Laboratories for A label and less class doors, 4' x 8' single or 8' x 8' pair.

C. Lock trim (knob, lever, sectional or escutcheon) shall be throughbolted through the lock case to assure correct alignment and proper operation.

D. Locksets shall conform to Federal Specification FF-H-106C, and be certified as meeting ANSI A156.13 Series 1000, Grade 1 requirements, ANSI A117.1, Accessibility Code (lever handle trim), and California State Reference Code, 1989 (formerly Title 19, California State Fire Marshall Standard)

E. Lever trim to match existing style, or as close as possible to existing style, in the rest of the facility

F. Acceptable and Approved: Schlage L Series, No Sub.

2.04 FLUSH BOLTS

A. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

B. Where openings are fire rated, provide automatic or constant latching flush bolts.

C. Acceptable and Approved as Follows:

Ives
Trimco
Rockwood

2.05 KEYING

A. All locks and cylinders shall be factory keyed at the direction of the owner where records are established and maintained. All cylinders shall be construction Master Keyed. Factory stamp all keys with “Do Not Duplicate” on one side and keyset symbol on the other side. A keying meeting is required prior to ordering cylinders for this project. Submit a separate keying submittal for review and approval.
Furnish “3” Cut keys for Each Biting – Balance in Blanks
Furnish “6” Building Master Keys
Furnish “2” Construction Core Removal Keys
Furnish “2” Permanent Core Installation Keys
Furnish “2” Construction Keys

B. Acceptable and Approved:

Schlage Everest 29 SFIC 7-pin, No Sub

2.06 EXIT DEVICES

LOW PROFILE PUSH BAR EXIT DEVICES

A. The maximum exit device projection shall be a maximum of 3-1/16” when activated. The exit device bar shall have an average minimum thickness of .201". The pushpad surface shall be constructed of stainless steel; pushpads with plastic or Lexan coatings shall not be acceptable. Nylon bearings and stainless steel springs shall be used for long life and durability. Only torsion or compression springs are acceptable. Extension type springs are not acceptable. All device covers shall be of cast brass, deep drawn steel or stainless steel. Latchbolts shall be of stainless steel and shall have a deadlocking latch for extra security, except at full-glass or two-light glass doors requiring narrow stile device. Mounting screws shall be concealed to deter tampering. All ferrous parts shall be zinc coated to prevent rusting.

B. Single point, one quarter turn hex dogging shall be standard on panic listed devices. Optional key cylinder dogging shall be available, and furnished if so indicated in the hardware sets, on panic listed devices. Devices with hex key dogging shall be easily field converted to cylinder dogging.

C. All devices shall be listed by Underwriters Laboratories for safety as panic hardware. Fire rated devices shall be UL listed for A label and lesser class doors, 4' x 8' single and 8' x 8' pair. The model number shall be located on the end cap; devices having the model number located other than on the end cap shall not be acceptable.

D. All exit devices shall have a unitized installation feature and may be cut in the field to size. Devices shall be closed on all sides with no pinch points. The pushpad shall be designed to prevent pinching of the fingers when depressed.

E. Exit Device trim to be throughbolted. Lever trim to be heavy duty forged escutcheon with free wheeling levers.

F. All exit devices shall conform to Federal Specification FF-H-1820, and be certified as meeting ANSI A156.3, Grade 1 requirements.

G. Acceptable and Approved:

Von Duprin	98 Series, No Sub

2.07 DOOR CLOSERS

A. Closers shall be rack and pinion construction. They shall be non-sized with adjustable spring power. Closing the door shall be controlled by two valves, one to control closing and one to control latching speed. Closers shall be regularly furnished with fully adjustable backcheck and a backcheck selector valve allowing approximate 70 degree backcheck on both regular and parallel arm closers. All closers shall be mounted with through bolts (SNB) - Provide Rivnuts at aluminum doors and frames with closers. Delayed action shall be available. Valves shall be concealed against unauthorized adjustment and be non-critical needle valve type. All closers shall be provided and installed with all necessary brackets, spacers, plates as required. Furnish and install with manufacture recommended screws. All screws must be installed in all parts, brackets, spacers, and plates.

B. Closers shall be certified as meeting the ANSI A156.4, Grade 1 requirements and be listed by Underwriters Laboratories for all classes of labeled doors.

C. Door Closers shall be furnished on all labeled doors.

D. Acceptable and Approved:

LCN	4040XP Series, No Sub

2.08 TRIM / KICK PLATES / DOOR STOPS / VIEWERS

A. All door protection plates to be manufactured of .050" stainless steel. Protection plates to be furnished 2" less than door width on single doors and 1" less than door width on pairs of doors unless otherwise noted in the hardware sets.

A. Floor mounted door stops shall be provided where door leaves will strike the floor stop at the end of their opening cycle. If other conditions exist, furnish overhead stops or closers with a stop arm as indicated in the hardware sets.

B. Provide two viewers where specified. One at 60" and one at ADA-compliant height

C. Acceptable and Approved as follows:

Trimco/Quality
Baldwin
Ives

2.09 WEATHERSTRIP/THRESHOLDS/SMOKE SEALS

A. Provide weatherstrip, thresholds, and/or sound seals for each opening as scheduled. Review Sill detail on Architectural drawings and furnish threshold type required. Brush type sweep only.

B. Provide smoke seal (including meeting stile seal for door pairs) for all fire rated doors. All smoke seal and astragals shall be listed by either Underwriters Laboratory or Warnock-Hersey as Category "H" – Smoke and Draft Control Gasket under the testing protocols of UBC Standard 7-2 – 1997, Part 2 and/or UL1784. All smoke seal and astragals shall, additionally, comply with the door manufacturer's listing under the same protocols.

C. Acceptable and Approved as follows:

National Guard
Reese
Zero

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware" for (Standard Steel Doors and Frames) by the Door and Hardware Institute

(DHI), except if otherwise specifically indicated or to comply with requirements of governing regulations, requirements for the handicapped, or if otherwise directed by the Architect.

B. All hardware shall be installed by a tradesman skilled in the application of commercial grade hardware.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Securely fasten all parts to be attached. Fit faces of mortise parts snug and flush. Make sure all operating parts move freely and smoothly without binding, sticking or excessive clearance. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, the hardware shall be removed and stored prior to the painting or finishing. Items shall then be reinstalled only when the finished have been completed on the surface to which the hardware is to be applied.

D. At exterior doors and elsewhere as indicated, set thresholds in a bed of sealant as specified in Section 07900 to completely fill concealed voids and excluded moisture from every source. Do not plug drain hole or block weeps. Remove excess sealant.

E. After installation, representative templates, instruction sheets and installation details shall be placed in a file folder to be turned over to the Owner when building is accepted. Included shall be at least five (5) each of any special adjusting and/or installation tools furnished with the hardware by the manufacturers.

PART 4 - SCHEDULES

4.01 HARDWARE SETS

126824 OPT0409348 VERSION 1
HARDWARE GROUP NO. 001L

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
		NOTE	REMAINDER OF HARDWARE BY DOOR MANUFACTURER		

-COORDINATE HARDWARE WITH DOOR MFR. PRIOR TO SUBMITTAL.
-REMOVE CYLINDER/CORE WHERE NOT REQUIRED.

HARDWARE GROUP NO. 003

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	NOTE	CASED OPENING - NO HARDWARE		

HARDWARE GROUP NO. 005L

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
		NOTE	REMAINDER OF HARDWARE BY DOOR MANUFACTURER		

-COORDINATE HARDWARE WITH DOOR MFR. PRIOR TO SUBMITTAL.
-REMOVE CYLINDER/CORE WHERE NOT REQUIRED.

HARDWARE GROUP NO. 103F

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050HD 03A L583-363	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 201C

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 201CW

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 201F

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 201FH

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP/HOLDER	FS40 (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 201FHW

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP/HOLDER	FS40 (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 203F

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 203FW

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 203SW

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	OH STOP	900S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 207

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	OH STOP	900S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 207AH

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	OH STOP & HOLDER	100H SERIES X TYPE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		

-VERIFY ALUMINUM DOOR IS WIDE STILE.
-5" STILE IS REQUIRED FOR THE SPECIFIED HARDWARE, COORDINATE WITH DOOR MFR./SUPPLIER.

HARDWARE GROUP NO. 207H

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	OH STOP & HOLDER	900H SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 212S

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358/FB458 AS REQ	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	OH STOP	900S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	MEETING STILE	8193AA (2 PCS - 1 SET) HEIGHT AS REQ (OMIT @ NON-RATED DOORS)	AA	ZER

HARDWARE GROUP NO. 341C

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/DB & IND	L9496HD 03A L583-363	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

-INDICATOR ON OUTSIDE OF DOOR.

HARDWARE GROUP NO. 341F

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/DB & IND	L9496HD 03A L583-363	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

-INDICATOR ON OUTSIDE OF DOOR.

HARDWARE GROUP NO. 343F

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/DB & IND	L9496HD 03A L583-363	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

-INDICATOR ON OUTSIDE OF DOOR.

HARDWARE GROUP NO. 401F

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 03A	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 403F

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 03A	626	SCH
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 403S

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 03A	626	SCH
1	EA	OH STOP	900S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 503F

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 710ACHM

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB HEIGHT AS REQ	689	VON
1	EA	PANIC HARDWARE	98-NL-OP-SNB LENGTH AS REQ	626	VON
1	EA	PANIC HARDWARE	98-EO-SNB LENGTH AS REQ	626	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
2	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		

-VERIFY ALUMINUM DOOR IS WIDE STILE.
-5" STILE IS REQUIRED FOR THE SPECIFIED HARDWARE, COORDINATE WITH DOOR MFR./SUPPLIER.

HARDWARE GROUP NO. 711C

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	PANIC HARDWARE	98-NL-SNB LENGTH AS REQ	626	VON
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HARDWARE GROUP NO. 730CM

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB HEIGHT AS REQ	689	VON
2	EA	PANIC HARDWARE	98-L-BE-03-SNB LENGTH AS REQ	626	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	MEETING STILE	8193AA (2 PCS - 1 SET) HEIGHT AS REQ (OMIT @ NON-RATED DOORS)	AA	ZER

HARDWARE GROUP NO. 738M

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB HEIGHT AS REQ	689	VON
2	EA	PANIC HARDWARE	98-L-BE-03-SNB LENGTH AS REQ	626	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7800 SERIES AS REQ	689	LCN
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	MEETING STILE	8193AA (2 PCS - 1 SET) HEIGHT AS REQ (OMIT @ NON-RATED DOORS)	AA	ZER
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY)	LGR	SCE

-PROVIDE 120VAC AND FIRE ALARM CONNECTIONS FOR WALL MAGNETIC HOLD OPENS.
-WIRE THE MAGNETIC HOLD OPENS TO THE FIRE ALARM SYSTEM.
-THE MAGNETIC HOLD OPENS ARE TO RELEASE UPON ACTIVATION OF THE FIRE ALARMS SYSTEM.

HARDWARE GROUP NO. 800AV

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
2	EA	DUMMY PUSH BAR	350 LENGTH AS REQ	626	VON
2	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		

HARDWARE GROUP NO. 811ACL

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	SGL CYL DEADBOLT	B660HD	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	PUSH/PULL BAR	9190-NO-10"	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR.		

-DEADBOLT TO LOCK DOWN RECEPTION ROOM AFTER HOURS.

HARDWARE GROUP NO. C201C

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092HDEU 03A RX CON (FAIL SECURE)	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY.)	LGR	SCE

-INGRESS BY THE CARD READER OR KEY OVERRIDE.
-EGRESS BY THE LEVER.

HARDWARE GROUP NO. C201CW

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092HDEU 03A RX CON (FAIL SECURE)	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY.)	LGR	SCE

-INGRESS BY THE CARD READER OR KEY OVERRIDE.
-EGRESS BY THE LEVER.

HARDWARE GROUP NO. C201F

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092HDEU 03A RX CON (FAIL SECURE)	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY.)	LGR	SCE

-INGRESS BY THE CARD READER OR KEY OVERRIDE.
-EGRESS BY THE LEVER.

HARDWARE GROUP NO. C201FW

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092HDEU 03A RX CON (FAIL SECURE)	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY.)	LGR	SCE

-INGRESS BY THE CARD READER OR KEY OVERRIDE.
-EGRESS BY THE LEVER.

HARDWARE GROUP NO. C710ACM

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB HEIGHT AS REQ	689	VON
1	EA	ELEC PANIC HARDWARE	RX-98-EO-CON-SNB LENGTH AS REQ	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-NL-OP-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
2	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
2	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC (COORDINATE PS WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS)		VON

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PADS.
-VERIFY ALUMINUM DOOR IS WIDE STILE.
-5" STILE IS REQUIRED FOR THE SPECIFIED HARDWARE, COORDINATE WITH DOOR MFR./SUPPLIER.

HARDWARE GROUP NO. C711A

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-NL-OP-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY.)	LGR	SCE

-INGRESS BY THE CARD READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PAD.
-VERIFY ALUMINUM DOOR IS WIDE STILE.
-5" STILE IS REQUIRED FOR THE SPECIFIED HARDWARE, COORDINATE WITH DOOR MFR./SUPPLIER.

HARDWARE GROUP NO. C714AM

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB HEIGHT AS REQ	689	VON
1	EA	ELEC PANIC HARDWARE	RX-98-EO-CON-SNB LENGTH AS REQ	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-NL-OP-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
2	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
2	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC (COORDINATE PS WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS)		VON

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PADS.
-VERIFY ALUMINUM DOOR IS WIDE STILE.
-5" STILE IS REQUIRED FOR THE SPECIFIED HARDWARE, COORDINATE WITH DOOR MFR./SUPPLIER.

HARDWARE GROUP NO. C715A

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-NL-OP-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY.)	LGR	SCE

-INGRESS BY THE CARD READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PAD.
-VERIFY ALUMINUM DOOR IS WIDE STILE.
-5" STILE IS REQUIRED FOR THE SPECIFIED HARDWARE, COORDINATE WITH DOOR MFR./SUPPLIER.

HARDWARE GROUP NO. C715AIS

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	WPRX-QEL-98-NL-OP-WH-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	655A LENGTH AS REQ	A	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY.)	LGR	SCE

-INGRESS BY THE CARD READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PAD.
-CYLINDER ON INTERIOR SIDE OF THE DOOR, ALLOWING ACCESS TO THE OUTSIDE CLASSROOM.
-FREE EGRESS FROM THE OUTSIDE CLASSROOM INTO THE BUILDING AT ALL TIME.

HARDWARE GROUP NO. C715PV

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-NL-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	SET	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
2	EA	VIEWER	U698 (ONE AT 60" & ONE AT ADA)	626	IVE
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY.)	LGR	SCE

-INGRESS BY THE CARD READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PAD.

HARDWARE GROUP NO. C718MR

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	FIRE RATED REMOVABLE MULLION	KR9954 STAB HEIGHT AS REQ	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-98-DT-F-CON-SNB LENGTH AS REQ	626	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-QEL-98-NL-F-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
2	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7800 SERIES AS REQ	689	LCN
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	SET	MEETING STILE	8193AA (2 PCS - 1 SET)	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
2	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY)	LGR	SCE

-DOORS NORMALLY HELD OPEN.
-ONCE LOCKED DOWN INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PADS.
-PROVIDE 120VAC AND FIRE ALARM CONNECTIONS FOR WALL MAGNETIC HOLD OPENS.
-WIRE THE MAGNETIC HOLD OPENS TO THE FIRE ALARM SYSTEM.
-THE MAGNETIC HOLD OPENS ARE TO RELEASE UPON ACTIVATION OF THE FIRE ALARMS SYSTEM.
-WIRE ELECTRIFIED LATCH BOLT TO THE FIRE ALARM SYSTEM.
-ELECTRIFIED LATCH BOLT TO REMAIN IN THE EXTENDED POSITION UPON FIRE ALARM ACTIVATION UNLESS MANUALLY RETRACTED BY THE PUSH PAD.

HARDWARE GROUP NO. CE341C

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM W/DEADBOLT W/ OUTSIDE INDICATOR	L9480HD 03A LLL L583-363 L283-722 (LESS STRIKE)	630	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	ELECTRIC STRIKE	55-F-DBM	630	SDC
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	POWER SUPPLY FOR E-STRIKE BY SECURITY CONTRACTOR		

-INGRESS BY CARD READER OR KEY OVERRIDE.
-THROWING DEADBOLT TO INTERACT WITH DEADBOLT MONITOR IN ELECTRIC STRIKE, TURNING OFF EXTERIOR CARD READER.
-RETRACTING DEADBOLT TO DISENGAGE DEADBOLT MONITOR AND TURN CARD READER BACK ON.
-FREE EGRESS FROM INTERIOR.

HARDWARE GROUP NO. CE341F

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM W/DEADBOLT W/ OUTSIDE INDICATOR	L9480HD 03A LLL L583-363 L283-722 (LESS STRIKE)	630	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	ELECTRIC STRIKE	55-F-DBM	630	SDC
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	POWER SUPPLY FOR E-STRIKE BY SECURITY CONTRACTOR		

-INGRESS BY CARD READER OR KEY OVERRIDE.
-THROWING DEADBOLT TO INTERACT WITH DEADBOLT MONITOR IN ELECTRIC STRIKE, TURNING OFF EXTERIOR CARD READER.
-RETRACTING DEADBOLT TO DISENGAGE DEADBOLT MONITOR AND TURN CARD READER BACK ON.
-FREE EGRESS FROM INTERIOR.

HARDWARE GROUP NO. CR207A

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092HDEU 03A RX CON (FAIL SECURE)	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY.)	LGR	SCE
1	EA	DOOR RELEASE	DOOR RELEASE BUTTON BY SECURITY CONTRACTOR		

-INGRESS BY THE CARD READER, REMOTE RELEASE OR KEY OVERRIDE.
-LOCKSET TO BE CONNECTED TO REMOTE RELEASE @ RECEPTIONIST DESK.
-DEPRESSION OF REMOTE RELEASE BUTTON TEMPORARILY UNLOCKS LEVER, ALLOWING FOR INGRESS.
-FREE EGRESS BY THE LEVER.

HARDWARE GROUP NO. CR714AM

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB HEIGHT AS REQ	689	VON
1	EA	ELEC PANIC HARDWARE	RX-98-EO-CON-SNB LENGTH AS REQ	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-NL-OP-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
2	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	MT SERIES BY SECURITY CONTRACTOR		
2	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC (COORDINATE PS WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS)		VON
1	EA	REMOTE RELEASE	REMOTE RELEASE BY SECURITY CONTACTOR		UNK

-INGRESS BY THE CREDENTIAL READER, REMOTE RELEASE, OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PADS.
-VERIFY ALUMINUM DOOR IS WIDE STILE.
-5" STILE IS REQUIRED FOR THE SPECIFIED HARDWARE, COORDINATE WITH DOOR MFR./SUPPLIER.

HARDWARE GROUP NO. D205

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	STOREROOM LOCK	L9080HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	SET	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE

-DOOR MONITORED ONLY.

HARDWARE GROUP NO. D715

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	PANIC HARDWARE	98-NL-SNB LENGTH AS REQ	626	VON
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	SET	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE

-DOOR MONITORED ONLY.

HARDWARE GROUP NO. DE714AM

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB HEIGHT AS REQ	689	VON
1	EA	ELEC PANIC HARDWARE	RX-98-EO-CON-SNB LENGTH AS REQ	626	VON
1	EA	ELEC PANIC HARDWARE	RX-98-NL-OP-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
2	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
2	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC (COORDINATE PS WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS)		VON

-DOORS MONITORED ONLY.
-VERIFY ALUMINUM DOOR IS WIDE STILE.
-5" STILE IS REQUIRED FOR THE SPECIFIED HARDWARE, COORDINATE WITH DOOR MFR./SUPPLIER.

HARDWARE GROUP NO. DE735AIS

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	WPRX-98-L-BE-03-WH-SNB LENGTH AS REQ	626	VON
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT PA @ CLASSROOMS. PROVIDE RIVNUTS @ ALD/ALF.)	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	655A LENGTH AS REQ	A	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY.)	LGR	SCE

-DOOR MONITORED ONLY.

HARDWARE GROUP NO. DE770ACM

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB HEIGHT AS REQ	689	VON
2	EA	ELEC PANIC HARDWARE	RX-98-EO-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
2	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC (COORDINATE PS WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS)		VON

-DOORS MONITORED ONLY.
-NO KEYED ENTRY. INGRESS BY THE PULL.
-VERIFY ALUMINUM DOOR IS WIDE STILE.
-5" STILE IS REQUIRED FOR THE SPECIFIED HARDWARE, COORDINATE WITH DOOR MFR./SUPPLIER.

HARDWARE GROUP NO. DE774AM

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB HEIGHT AS REQ	689	VON
2	EA	ELEC PANIC HARDWARE	RX-98-EO-CON-SNB LENGTH AS REQ	626	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ (PROVIDE RIVNUTS @ ALD/ALF)	689	LCN
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
2	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC (COORDINATE PS WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS)		VON

-DOORS MONITORED ONLY.
-NO KEYED ENTRY. INGRESS BY THE PULL.
-VERIFY ALUMINUM DOOR IS WIDE STILE.
-5" STILE IS REQUIRED FOR THE SPECIFIED HARDWARE, COORDINATE WITH DOOR MFR./SUPPLIER.

HARDWARE GROUP NO. J002

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
		NOTE	REMAINDER OF HARDWARE BY DOOR MANUFACTURER		

HARDWARE SET IS A GUIDELINE
-VERIFY AND COORDINATE ALL HARDWARE WITH DOOR/FRAME MANUFACTURER PRIOR TO SUBMITTALS.
-ALL REMAINING HARDWARE BY GATE MFR.

HARDWARE GROUP NO. J725

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	SET	GATE CLOSER AND HINGES	LOCINOX MAMMOTH180-ZILV	626	LOC
1	EA	PANIC HARDWARE	98-EO-WH-SNB LENGTH AS REQ	626	VON
		NOTE	BALANCE OF HARDWARE BY GATE MANUFACTURER		

-COORDINATE ALL HARDWARE WITH THE GATE MFR. PRIOR TO SUBMITTALS.
-1EA 3/4” MOUNTING PLATE FOR EXIT DEVICE.
-PROVIDE PLATE OR MESH ON GATE TO PREVENT INDIVIDUALS FROM REACHING IN AND OPENING THE GATE FROM SECURE SIDE.
-EXIT ONLY. NO ENTRY.
-EGRESS BY THE PUSH PAD.

HARDWARE GROUP NO. T750R.1

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	WS-T-9827-EO-F-SNB LENGTH & HEIGHT AS REQ	626	VON
1	EA	FIRE EXIT HARDWARE	WS-T-9827-L-BE-F-2SI-03-377T-KC-SNB LENGTH & HEIGHT AS REQ	626	VON
2	EA	LATCH GUARD	WS-LGO LENGTH AS REQ	630	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
2	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	SURFACE CLOSER	4040XP RW/PA MC TBWMS X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	SET	MEETING STILE	8193AA (2 PCS - 1 SET)	AA	ZER

-FOR USE WITH STEELCRAFT PALADIN DOOR ASSEMBLY.
-MEETS ICC 500-2020 AND FEMA 320/361.
-MAXIMUM DOOR SIZE 4'0 X 8'0 (SINGLE) AND 8'0 X 8'0 (PAIR).
-IF ANOTHER DOOR MFR. IS USED CONSULT WITH THEM FOR APPROVED HARDWARE, DOORS AND HARDWARE ARE SOLD AS A COMPLETE TESTED ASSEMBLY.
-GC TO PROVIDE SIGNAGE THAT MEETS ICC 500-2020 REQUIREMENTS, AS NEEDED.

-2SI "UNLOCKED":
-OUTSIDE LEVER IS ACTIVE WHEN -2SI IS SET TO "UNLOCKED" STATE.
-INGRESS BY OUTSIDE LEVER.
-FREE EGRESS BY THE PUSH PADS.

-2SI "LOCKED":
-OUTSIDE LEVER IS RIGID WHEN -2SI IS SET TO "LOCKED" STATE.
-THUMBTURN IS RIGID.
-INGRESS BY KEY OVERRIDE.
-TURN KEY TO ACTIVATE CYLINDER CONTROL.
-ROTATE CYLINDER CONTROL THUMBTURN TO RETRACT LATCHBOLTS.
-PULL RIGID LEVER TO OPEN DOOR.
-CANNOT REMOVE KEY IN 377T-KC (KEY CAPTURE) CYLINDER CONTROL WHILE ACTIVATED.
-FREE EGRESS BY THE PUSH PADS.

HARDWARE GROUP NO. T756HR.1

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	WS-T-9827-EO-F-SNB LENGTH & HEIGHT AS REQ	626	VON
1	EA	FIRE EXIT HARDWARE	WS-T-9827-L-BE-F-2SI-03-377T-KC-SNB LENGTH & HEIGHT AS REQ	626	VON
2	EA	LATCH GUARD	WS-LGO LENGTH AS REQ	630	VON
1	EA	SFIC MORTISE CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
2	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	OH STOP	900SE SERIES X SIZE & MOUNTING AS REQ	630	GLY
2	EA	FIRE/LIFE CLOSER	4040SE MC TBWMS X MTG BRKT, SPCR, PLATE X VOLTAGE AS REQ	689	LCN
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	SET	MEETING STILE	8193AA (2 PCS - 1 SET)	AA	ZER
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC (COORDINATE POWER SUPPLIES WITH SECURITY PRIOR TO SUBMITTAL. OMIT WHERE PROVIDED BY SECURITY)	LGR	SCE

-FOR USE WITH STEELCRAFT PALADIN DOOR ASSEMBLY.
-MEETS ICC 500-2020 AND FEMA 320/361.
-MAXIMUM DOOR SIZE 4'0 X 8'0 (SINGLE) AND 8'0 X 8'0 (PAIR).
-IF ANOTHER DOOR MFR. IS USED CONSULT WITH THEM FOR APPROVED HARDWARE, DOORS AND HARDWARE ARE SOLD AS A COMPLETE TESTED ASSEMBLY.
-GC TO PROVIDE SIGNAGE THAT MEETS ICC 500-2020 REQUIREMENTS, AS NEEDED.

-2SI "UNLOCKED":
-OUTSIDE LEVER IS ACTIVE WHEN -2SI IS SET TO "UNLOCKED" STATE.
-INGRESS BY OUTSIDE LEVER.
-FREE EGRESS BY THE PUSH PADS.

-2SI "LOCKED":
-OUTSIDE LEVER IS RIGID WHEN -2SI IS SET TO "LOCKED" STATE.
-THUMBTURN IS RIGID.
-INGRESS BY KEY OVERRIDE.
-TURN KEY TO ACTIVATE CYLINDER CONTROL.
-ROTATE CYLINDER CONTROL THUMBTURN TO RETRACT LATCHBOLTS.
-PULL RIGID LEVER TO OPEN DOOR.
-CANNOT REMOVE KEY IN 377T-KC (KEY CAPTURE) CYLINDER CONTROL WHILE ACTIVATED.
-FREE EGRESS BY THE PUSH PADS.

-WIRE THE FIRE/LIFE CLOSERS TO THE FIRE ALARM SYSTEM.
-THE FIRE/LIFE CLOSERS ARE TO RELEASE UPON ACTIVATION OF THE FIRE ALARMS SYSTEM.

HARDWARE GROUP NO. TD205FIW

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5	652	IVE
1	EA	MULT PT STOREROOM	LM9380HD 03A	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA MC TBWMS X MTG BRKT, SPCR & PLATE AS REQ (MOUNT ON INTERIOR)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436 X RISER AS REQ (MOUNT WHERE FLOOR STOP WILL NOT BE A TRIPPING HAZARD)	626	IVE
1	SET	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	656A LENGTH AS REQ	A	ZER
1	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE

-FOR USE WITH STEELCRAFT PALADIN DOOR ASSEMBLY.
-MEETS ICC 500-2014 AND FEMA 320/361.
-MAXIMUM DOOR SIZE 4'0 X 8'0 (SINGLE) AND 8'0 X 8'0 (PAIR).
-APPROVED HARDWARE, DOORS AND HARDWARE ARE SOLD AS A COMPLETE TESTED ASSEMBLY.
-DOOR MONITORED ONLY.

HARDWARE GROUP NO. TD714.1

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	LD-WS-T-9827-EO-SNB LENGTH & HEIGHT AS REQ	626	VON
1	EA	PANIC HARDWARE	LD-WS-T-9827-L-KC-03-SNB LENGTH & HEIGHT AS REQ	626	VON
2	EA	LATCH GUARD	WS-LGO LENGTH AS REQ	630	VON
1	EA	SFIC RIM CYLINDER	TYPE AS REQ W/ KEYED CONST. CORE	626	SCH
1	EA	SFIC EVEREST CORE	80-037 KEYED AS DIRECTED	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH MC TBWMS X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	SET	GASKETING	328AA H & J	AA	ZER
1	SET	MEETING STILE	8193AA (2 PCS - 1 SET)	AA	ZER
2	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	656A LENGTH AS REQ	A	ZER
2	EA	DOOR CONTACT	DOOR CONTACT(S) BY SECURITY CONTRACTOR	WHT	SCE

-FOR USE WITH STEELCRAFT PALADIN DOOR ASSEMBLY.
-MEETS ICC 500-2020 AND FEMA 320/361.
-MAXIMUM DOOR SIZE 4'0 X 8'0 (SINGLE) AND 8'0 X 8'0 (PAIR).
-IF ANOTHER DOOR MFR. IS USED CONSULT WITH THEM FOR APPROVED HARDWARE, DOORS AND HARDWARE ARE SOLD AS A COMPLETE TESTED ASSEMBLY.
-GC TO PROVIDE SIGNAGE THAT MEETS ICC 500-2020 REQUIREMENTS, AS NEEDED.

-DOORS MONITORED ONLY.
-INGRESS BY KEY OVERRIDE. TURN KEY TO ACTIVATE LEVER. CANNOT REMOVE KEY IN L-KC (KEY CAPTURE) WHILE ACTIVATED.
-FREE EGRESS BY THE PUSH PADS.

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Plastic films.

D. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

B. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

C. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

D. Section 08 4413 - Glazed Aluminum Curtain Walls: Glazing furnished as part of wall assembly.

1.03 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.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1036 - Standard Specification for Flat Glass; 2016.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

I. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

K. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

L. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

M. GANA (GM) - GANA Glazing Manual; 2008.

N. GANA (SM) - GANA Sealant Manual; 2008.

O. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

P. ICC (IBC) - International Building Code; 2018.

Q. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).

R. ITS (DIR) - Directory of Listed Products; current edition.

S. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

T. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).

U. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

V. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 DEFINITIONS

A. Sealed Insulating Glass Unit Surfaces:
   1. Side 1 - Exterior surface of outer pane.
   2. Side 2 - Interior surface of outer pane.
   3. Side 3 - Interior surface of inner pane.
   4. Side 4 - Exterior surface of inner pane.

1.05 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.

1.06 SUBMITTALS

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

B. Product Data on Insulating Glass Unit, Glazing Unit, Plastic Sheet Glazing Unit, and Plastic Film 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. Samples: Submit two samples 4 by 6 inch in size of insulated glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).
      b. Safety Glazing Certification Council (SGCC).

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience and approved by manufacturer.

1.08 MOCK-UPS

A. See Section 01 4000 - Quality Requirements, for additional mock-up 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.

1.09 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.

1.10 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Viracon, Inc: www.viracon.com/#sle.
   2. Other Fabricators as approved by the Float Glass Manufacturer.
   3. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Float Glass Manufacturers:
   1. AGC Glass North America, Inc: www.agcglass.com/#sle.
   2. Guardian Glass, LLC: www.guardianglass.com/#sle.
   3. Pilkington North America Inc: www.pilkington.com/na/#sle.
   4. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   5. Substitutions: Refer to Section 01 6000 - Product Requirements.

C. Fire-Resistance-Rated Glass: Provide products as required to achieve indicated fire-rating period.
   1. Fabricators:
      a. GGI - General Glass International: www.generalglass.com/#sle.
      b. McGrory Glass. Inc.: www.mcgrory.com
   2. 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.
      d. Substitutions: Refer to Section 01 6000 - Product Requirements.

D. Fire-Protection-Rated Glass: Provide products as required to achieve indicated fire-rating period.
   1. Fabricators:
      a. McGrory Glass. Inc.: www.mcgrory.com
   2. Manufacturers:
      a. SAFTIFIRST, a division of O'Keeffe's Inc: www.safti.com/#sle.
      b. SCHOTT North America Inc: www.us.schott.com/#sle.
      c. Technical Glass Products: www.fireglass.com/#sle.
      d. Vetrotech North America: www.vetrotechusa.com/#sle.
      e. Substitutions: Refer to Section 01 6000 - Product Requirements.

E. Decorative Film Manufacturers:
   1. 3M Window Film: solutions.3m.com/wps/portal/3M/en_US/Window_Film/Solutions/#sle.
   2. Decorative Films, LLC.: www.decorativefilm.com.
   3. Flexvue Films: www.flexvuefilms.com/#sle.
   4. Llumar, an Eastman Chemical Company: www.llumar.com/#sle.
   5. Madico, Inc.: www.madico.com.
   6. Substitutions: Refer to Section 01 6000 - Product Requirements.

F. Security Film Manufacturers:
   1. 3M Window Film: solutions.3m.com/wps/portal/3M/en_US/Window_Film/Solutions/#sle.
   2. Armoured One: www.armouredone.com/#sle.
   3. Madico, Inc.: www.madico.com.

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 applicable codes.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. 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.
   4. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.

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. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   5. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II criteria.
   6. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
   7. 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 A or 16 CFR 1201 - Category II impact test requirements.
   2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum or thickness as required to meet performance criteria.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
   1. Any of the manufacturers specified for float glass.
   2. Fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

B. 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. Metal Edge Spacers: Aluminum, bent and soldered corners.
4. Spacer Color: Aluminum.
5. Edge Seal:
    a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone sealant as secondary seal applied around perimeter.
    b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.
7. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
    a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.

C. Type GIT - Insulating Glass Units: Vision glass, double glazed.
1. Appl ications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Heat-strengthened float glass, 1/4 inch thick unless fully tempered is required by code.
    a. Tint: Light Gray Appearance.
    b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick unless fully tempered is required by code.
    a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, maximum.
7. Visible Light Transmittance (VLT): 36 percent, minimum.
8. Solar Heat Gain Coefficient (SHGC): 0.23, maximum.
9. Visible Light Reflectance, Outside: 13 percent, maximum.
10. Glazing Method: Dry glazing method, gasket glazing.

D. Type IGSF - Insulating Glass with applied Security Film.
1. Space between lites filled with air.
2. Outboard Lite: Fully tempered float glass, 1/4 inch thick.
    a. Tint: Light Gray Appearance.
    b. Coating: Low-E (passive type), on #2 surface.
3. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
    a. Tint: Clear.
    b. Provide Security Film and anchoring system as specified in 2.06, A, on #4 surface.
4. Total Thickness: 1 inch.
5. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, maximum.
6. Visible Light Transmittance (VLT): 36 percent, minimum.
7. Solar Heat Gain Coefficient (SHGC): 0.23, maximum.
8. Visible Light Reflectance, Outside: 13 percent, maximum.
9. Glazing Method: Dry glazing method, gasket glazing.

E. SLG Insulating Glass Units: Spandrel glazing.
1. Applications: Exterior spandrel glazing unless otherwise indicated.
2. Space between lites filled with air.

3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum, unless fully tempered is required by code.
   a. Tint: Light Gray.
   b. Coating: Same as on vision units, on #2 surface.
4. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick.
   a. Tint: Clear.
   b. Opacifier: Ceramic frit, on #4 surface.
   c. Opacifier Color: Match insulated unit.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.
7. Visible Light Reflectance, Outside: 13 percent, maximum.
8. Glazing Method: Dry glazing method, gasket glazing.

2.05 GLAZING UNITS

A. Type CTG - Monolithic Tempered Glazing:
   1. Applications: As scheduled.
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.
   5. Glazing Method: Dry glazing method, gasket glazing.

B. Type IBG - Monolithic Interior Butt Joint Glazing:
   1. Applications: As scheduled.
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: Glass thickness shall be per GANA and manufacturers recommendations for span width and height of each installation.
   5. Glazing Method: Butt joint glazing method, sealant only.
   6. Provide 3/8" gap between glazing panels or as required by the manufacturer.

C. Type FRG - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period exceeding 45 minutes.
   1. Glazing intended for fire-rated glazed walls and openings larger than typically permitted in fire doors and fire windows.
   2. Applications:
      a. Glazing in fire-rated door assembly.
      b. Glazing in fire-rated window assembly.
      c. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
      d. Other locations as indicated on drawings.
   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.
   7. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.

D. Type FRG - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve fire-doors indicated fire-rating period as indicated on drawings.

1. Glazing for protecting openings up to the size prescribed by the building code and by the tested products, generally 100 square inches or less.
2. Applications:
   a. Glazing in fire-rated door assembly.
   b. Glazing in fire-rated window assembly.
   c. Other locations as indicated on drawings.
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.
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

E. Type LTSG - Laminated Tempered Safety Glass.: .
1. Applications: Locations as indicated on drawings.
2. Tint: Clear.
3. Thickness: 7/16 inch.
4. Outer Lite: Tempered glass.
5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
6. Inside Lite: Tempered glass.
7. Performance Criteria:
   a. As specified in paragraph 2.03 Glass Materials.

F. Type MIR - Unframed Mirrors: Polish plate with two coats, protected on back by electrolytically layer of cooper with shellac and mirror backing paint. Mirrors shall be installed with safety backing laminated.
1. Applications: Provide and install mirrors on wall where noted on drawings as unframed mirror.
2. Thickness: 1/4 inch.
3. Provide hanging and anchorage supports, as required and grind edges.

2.06 PLASTIC FILMS

A. Security Film: Polyester type.
1. Application: Locations as indicated on drawings.
2. Surface Burning Characteristics: Flame Spread Index (FSI)/Smoke Developed Index (SDI) of Class A, 25/450, maximum, when tested in accordance with ASTM E84.
3. Tensile Strength: Minimum of 25,000 psi when measured in accordance with ASTM D882.
4. Break Strength: Minimum of 350 lbs when measured in accordance with (ASTM D 882) (Per Inch Width).
5. Impact Resistance: Comply with ANSI Z97.1, Class A and 16 CFR 1201, Category II impact test requirements when applied to 1/8 inch thick annealed glass.
6. Forced Entry Protection: Independent lab testing according to UL 972 protocol (Multiple Impact Test).
7. Color: Clear.
8. Thickness: 0.014 inch
9. Anchoring System: Provide structural silicone sealant or adhesive attachment system as required to achieve performance criteria and as approved my the Security Film Manufacturer.
   a. Dow 995.
   b. BondKap.
   c. Pentagon Elite GSS.

B. Decorative Plastic Film: Polyester type.
   1. Application: Locations as indicated on drawings.
   2. Series Type: See Section 01 6210 - Schedule of Materials and Colors..
   3. Thickness: 0.002 inch, minimum.
   4. Adhesive Type: Pressure-sensitive.

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; non-bleeding, non-staining; 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. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness. 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. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; color black.

D. Glazing Clips: Manufacturer's standard type.

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 within maximum of 24 hours 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. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. 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 (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - BUTT JOINT GLAZING METHOD (SEALANT ONLY)

A. Temporarily brace glass in position for duration of glazing process; mask edges of glass at adjoining glass edges and between glass edges and framing members.

B. Temporarily secure a small diameter non-adhering foamed rod on back side of joint.

C. Apply sealant to open side of joint in continuous operation; thoroughly fill joint without displacing foam rod, and then tool sealant surface smooth to concave profile.

D. Permit sealant to cure then remove foam backer rod, and then apply sealant to opposite side, tool smooth to concave profile.

E. Remove masking tape.

3.06 INSTALLATION - PLASTIC FILM

A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.

B. Place without air bubbles, creases or visible distortion.

C. Install film tight to perimeter of glass and carefully trim film with razor sharp knife. Provide 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required. Do not score the glass.

3.07 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent 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 9100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Division 23 - HVAC: Ductwork attachment to louvers.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2015.

C. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.04 SUBMITTALS

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

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. Samples: Submit two samples 12 by 12 inches in size illustrating finish and color of exterior and interior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Maintenance Data: Include lubrication schedules, adjustment requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum five years of documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.

1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:

1. Airolite Company, LLC: www.airolite.com.
2. American Warming and Ventilating: www.awv.com.
3. Construction Specialties, Inc: www.c-sgroup.com.
4. Ruskin Manufacturing; www.ruskin.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load as required by code without damage or permanent deformation.
   2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
   3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.

B. Wind Driven Rain Resistant LouversLouvers: Horizontal blade, extruded aluminum construction.
   1. Free Area: 44 percent, minimum.
   2. Blades: Sightproof with drainable edge design.
   3. Frame: 5 inches deep, channel profile; corner joints mitered and , with continuous recessed caulking channel each side.
   4. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.
   5. Aluminum Finish: Class I natural anodized.
   6. Product: Use the following or any equivalent made by one of the listed manufacturers: Model EME520DD - Ruskin Company.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

2.04 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Color: See Section 01 6210 - Schedule of Materials and Colors.

2.05 ACCESSORIES

A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.

B. Fasteners and Anchors: Stainless steel.

C. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Set sill members and sill flashing in continuous bead of sealant.

D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Secure louver frames in openings with concealed fasteners.

F. Coordinate with installation of mechanical ductwork.

G. Coordinate with installation of louver actuators.

3.03 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.04 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 08 9129
TORNADO RESISTANT LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tornado Shelter Louvers.
   1. Any references in the Contract Documents to a “Storm Louver” shall refer to Tornado Resistant Louvers for the Tornado Shelter.

1.02 RELATED REQUIREMENTS

A. The Contract Documents, as defined in Document 00 7213 - General Conditions and modifications thereto, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

B. Related Sections:
   1. Section 01 1400 – Work Restrictions: Work Restrictions related to the Tornado Shelter
   2. Section 03 4100 - Precast Structural Concrete
   3. Section 04 2000 - Unit Masonry
   4. Section 09 9000 - Paints and Coatings

1.03 REFERENCES

A. ICC/NSSA Standard for the Design and Construction of Storm Shelters:
   1. ICC 500-2014 American National Standard

1.04 SYSTEM DESCRIPTION

A. Tornado shelter storm louvers shall be provided as an integral ICC 500-2014 Tested and Certified assembly from a single supplier. Unless the AHJ indicates otherwise in writing before issuing a building permit, the Architect shall be permitted to allow compliance with the testing requirements of ICC 500-2008 and labels indicating compliance with “ICC 500”, “ICC 500-2008” in lieu of “ICC 500-2014” provided that the size of the louver is less than the maximum size tested and more than the minimum size tested (or approximately matching the nominal size tested if only one size was tested). (Note to AHJ before issuing building permit: The reason for allowing the Architect to accept labelling associated with older standards is because many products meet the testing requirements of ICC 500-2014 but have not yet been able to obtain the new label.)

B. Design Requirements:
   1. Louvers shall be tested and must comply with FEMA 361/ICC 500, and have verifiable third party conformance test results and be certified by a Nationally Recognized Independent Testing Laboratory such as Underwriter’s Laboratories (UL).

1.05 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Requirements for submittals.
   1. Product Data:
      a. Materials and details of design and construction, reinforcement type and locations, anchorage and fastening methods, and finishes.
   2. Shop Drawings: Details of each opening, showing elevations and frame openings. Show provisions for installation conforming to ICC 500 requirements.
   3. Assurance/Control Submittals:
      a. Independent Tests: Complete louver assembly shall have been tested and certified by Underwriter’s Laboratories (UL) for compliance with ICC 500 requirements.
      b. Test Reports: Report for design wind pressure and missile impact tests in accordance with National Performance Criteria for Tornado Shelters Federal Emergency Management Agency Mitigation Directorate, latest edition.

c. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
d. ICC 500 requirements.
e. Qualification Documentation: Upon request, submit documentation of experience indicating compliance with specified qualification requirements.

B. Section 01 7800 - Closeout Submittals: Procedures for closeout submittals.
1. Warranty: Submit written warranty with forms complete in Owner's name and registered with manufacturer as specified in this Section.
2. Installation Certification: Submit written certification of installation on form provided.

1.06 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer: Company specializing in manufacturing the products ICC 500 storm louvers as specified in this section with minimum five years documented experience.

B. Regulatory Requirements:
1. Tornado Shelter Louver Construction: Conform to ICC 500.

C. Manufacturer Installation Instructions: Contractor shall maintain current copy of tornado shelter storm louver manufacturer published installation instructions and ICC 500 requirements in Project Field Office and refer to installation instructions at all times during installation.

D. Grilles shall be tested in accordance with and pass the ICC 500 standard for wind-borne debris, which simulates a 15 pound 2 x 4 traveling at 100 miles per hour.

E. Grilles must be UL Listed (or equivalent 3rd party certification) for compliance with ICC 500.

F. Grilles shall be designed to withstand a wind-load of 300 pounds per square foot. The manufacturer shall provide structural calculations upon request.

G. Grilles shall be installed in accordance with the manufacturers published installation instructions.

H. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 6000 - Product Requirements: Transport, handle, store, and protect Products.

B. Deliver louvers in manufacturer's standard labeled protective packaging.

C. Accept Products on site in manufacturer's packaging. Inspect for damage. Return damaged Products and replace with undamaged Products.

D. Project Field Superintendent shall inspect Products immediately upon delivery to Project Site, determine Product conformance with specified requirements and reject Products not complying with specifications. Project Field Superintendent shall direct that non-complying Products be removed from Project Site immediately.

E. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

1.08 COORDINATION

A. Coordinate the work with louver opening construction and installation.

1.09 WARRANTY

A. Section 01 7800 - Closeout Submittals: Procedures for closeout submittals.

B. Manufacturer Warranty: Provide one (1) year manufacturer warranty for defects in material and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Single Source for Furnishing and Installation: Tornado shelter louvers shall be furnished and installed by tornado shelter louver supplier. Installation by any other entity not permitted.

B. Manufacturers:
   1. Greenheck: www.greenheck.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

C. Section 01 6000 - Product Requirements: Product options and substitutions: Substitutions: Permitted. Only manufacturers that can provide louvers as an ICC 500 Tested and Certified assembly may submit for consideration as a substitute manufacturer.

2.02 TORNADO SHELTER LOUVERS

A. Basis of Design: AFL-501 as manufactured by Greenheck

B. Frame:
   1. 5 1⁄2 in. deep formed 1⁄4 in. thick aluminum. Flanges shall be located at the head and sill or sides as required or is standard for the manufacturer.

C. Blades:
   1. 3 in. x 3 in. x 1⁄4 in. thick inverted V style extruded aluminum.

D. Construction:
   1. Welded.

E. Screens:
   1. Internally mounted 1⁄16 in. thick fattened expanded aluminum.

F. Finish:
   1. Mill aluminum

G. Size:
   1. Reference Drawings

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 7000 - Execution and Closeout Requirements: verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify existing conditions and opening dimensions before starting work.
   2. Verify that opening sizes and tolerances are acceptable.
   3. Do not install louvers in openings that are not plumb or are out-of-tolerance for size or alignment.

C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 INSTALLATION

A. Install louvers in accordance with manufacturer’s published instructions and requirements of ICC 500.

B. Use templates provided by hardware item manufacturer.

3.03 FIELD QUALITY CONTROL

A. Section 01 4000 - Quality Control: Contractor Quality Control Representative shall perform contractor quality control inspections.
   1. Inspect louver installation, fit and clearance. Verify required ICC 500 label.
   2. Inspect louver installation and operation for conformance with ICC 500 requirements.
   3. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
   4. Test and Inspection Reports shall be available to Architect upon request.

B. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

3.04 ADJUSTING CLEANING

A. Adjust for smooth and balanced door movement.

B. Adjust closers for full closure.

C. Clean immediately after installation.

D. Clean and polish just before Substantial Completion Inspection.

TORNADO SHELTER LOUVER INSTALLATION CERTIFICATION

PROJECT:

LOCATION:

ARCHITECT'S PROJECT NUMBER:

OWNER:

CONTRACTOR: _____

LOUVER INSTALLER:

Name: _____

Address: _____

Telephone Number: _____

UPON COMPLETION OF INSTALLATION INSTALLER CERTIFIES THAT:

A. Installer obtained a current copy of the manufacturer's published installation instructions and ICC 500-2014 requirements for the specific louver being installed.

B. Installer reviewed and discussed manufacturer's published installation instructions and ICC 500-2014 requirements with Project Field Superintendent before start of installation.

C. Installer furnished and installed specified tornado shelter louvers in accordance with the Contract Documents.

D. Installer installed tornado shelter louvers in conformance with manufacturer's published installation instructions and ICC 500-2014 requirements.

EXECUTED AND DELIVERED this _____ day of _____, 20___ .

_____

(Company name)

BY: _____

(Authorized signature)

Subscribed and sworn to before me this _____day of _____, 20___.

_____

Notary Public

_____

My Commission expires: Affix Seal

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Exterior gypsum sheathing.

C. Gypsum wallboard.

D. Joint treatment and accessories.

E. Textured finish system.

1.02 RELATED REQUIREMENTS

A. Section 03 1119 - Insulating Concrete Forms

B. Section 05 4000 - Cold-Formed Metal Framing: Structural steel stud framing.

C. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

D. Section 07 2100 - Thermal Insulation: Acoustic insulation.

E. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

F. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

B. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2018.

C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2019b.

D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2018.

E. 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; 2015.

F. 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; 2018.

G. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2019.

H. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

I. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2013.

J. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018.

K. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

N. ASTM E413 - Classification for Rating Sound Insulation; 2016.

O. GA-214 - Levels of Finish for Gypsum Panel Products; 2021.

P. GA-216 - Application and Finishing of Gypsum Panel Products; 2018.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of experience.

B. Product Qualifications:
   1. Single Source Responsibility:
      a. Obtain gypsum board products, joint treatment products, and textured coatings from a single manufacturer.

C. Mock-ups
   1. At an area on the site where approved by the Architect, provide a mock-up gypsum wallboard panel.
      a. Make the panel approximately 4'-0" square.
      b. Provide one mock-up panel for each gypsum wallboard finish used on the Work.
      c. For exterior gypsum sheathing, panel shall be complete with all joint sealant, wall ties and/or connectors, flashings and face veneer.
      d. The mock-ups may be used as part of the Work, and may be included in the finished Work, when so approved by the Architect.
      e. Revise as necessary to secure the Architect's approval.
   2. The mock-up panels, when approved by the Architect, will be used as datum points for comparison with the remainder of the work of this Section for the purpose of acceptance or rejection.

D. Reference Standards:
   1. Install gypsum board in accordance with applicable requirements and recommendations of Gypsum Association GA 216, "Recommended Specifications for the Application and Finishing of Gypsum Board", except for more stringent requirements of manufacturer.
   2. Apply acoustical sealant in accordance with applicable requirements of ASTM C919.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 – Product Requirements.

B. Acceptance at Site
   1. Deliver material to site promptly without undue exposure to weather.
   2. Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.

C. Storage and Protection
   1. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.
   2. Store above ground in dry, ventilated space.
   3. Broken, or damaged gypsum board will be rejected, whether built-in or not.

1.07 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.

2. Do not begin installation of gypsum board until building is completely enclosed and protected from water infiltration.
3. Do not install gypsum board when ambient temperature is below 40ºF.
4. For adhesive attachment of gypsum board, and for finishing of gypsum board, maintain ambient temperature above 55ºF from one week prior to attachment or joint treatment, and until joint treatment is complete and dry.
5. Maintain illumination as required for proper installation of material.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
   1. See PART 3 for finishing requirements.

B. Interior Partitions: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire-Resistance-Rated Assemblies: Provide completed assemblies complying with applicable code.

2.02 METAL FRAMING MATERIALS

A. Structural and Non-Structural Steel Framing for Application of Gypsum Board: As specified in Section 05 4000.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   3. National Gypsum Company: www.nationalgypsum.com/#sle.
   4. USG Corporation: www.usg.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application:
      a. Non-fire rated partitions and ceilings: Type X.
      b. Fire rated partitions: Type X.
      c. Fire rated ceilings: Type C.
      d. ICF Wall Assemblies: Mold Resistant
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold resistant board is required on interior face of all ICF wall assemblies.
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. ICF Wall Assemblies: 1/2 inch.
      d. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
   4. Paper-Faced Products:
      a. CertainTeed Corporation; Type X and C Drywall: www.certainteed.com/#sle.
      b. Georgia-Pacific Gypsum; ToughRock Fireguard X and C: www.gpgypsum.com/#sle.
      c. National Gypsum Company; Gold Bond BRAND Fire-Shield Type X and C Gypsum Board: www.nationalgypsum.com/#sle.
      d. USG Corporation; USG Sheetrock Brand Firecode X and C Panels: www.usg.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements.

5. Mold Resistant Paper Faced Products:
   a. CertainTeed Corporation; M2Tech 1/2" Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
   b. Georgia-Pacific Gypsum; ToughRock Mold-Guard: www.gpgypsum.com/#sle.
   c. National Gypsum Company; Gold Bond XP Gypsum Board: www.nationalgypsum.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.

C. Backing Board For Wet Areas:
1. Application: Surfaces behind tile and in wet areas including tub and shower surrounds, shower ceilings, and typical wall drywall base as detailed on the drawings.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
   a. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch.
   b. Products:
      1) CertainTeed Corporation; GlasRoc 5/8" Type X Tile Backer: www.certainteed.com/#sle.
      2) Georgia-Pacific Gypsum; DensShield Tile Backer: www.gpgypsum.com/#sle.
      3) National Gypsum Company; Gold Bond eXP Tile Backer: www.nationalgypsum.com/#sle.
      4) Substitutions: See Section 01 6000 - Product Requirements.

D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
4. Core Type: Type X, as indicated.
5. Edges: Square.
6. Glass Mat Faced Products:
   a. CertainTeed Corporation; GlasRoc Type X Exterior Sheathing: www.certainteed.com/#sle.
   b. Georgia-Pacific Gypsum; DensGlass Fireguard Sheathing: www.gpgypsum.com/#sle.
   c. National Gypsum Company; Gold Bond eXP Sheathing: www.nationalgypsum.com/#sle.
   d. USG Corporation; USG Securock Brand Ultralight Glass-Mat Sheathing Firecode X: www.usg.com/#sle.
   e. Substitutions: See Section 01 6000 - Product Requirements.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: As specified in Section 07 2100.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Water-Resistive Barrier: As specified in Section 07 2500.

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
2. Splayed Corner Beads: All other than 90 degree outside corner.
3. Architectural Reveal Beads:
   a. Shapes: As indicated on drawings.
4. Expansion Joints:

a. Type: V-shaped metal with factory-installed protective tape.

5. Adjustable Partition Closure between storefront and drywall: Gordon Interior Specialties; Mullion Mate. Provide insulation and gaskets. Size to match application. Finish to match storefront.
6. Other trims and reveals where shown on the drawings.

E. Moisture Guard Trim: ASTM C1047, rigid plastic, 48 inch length, applied to bottom edge of gypsum board.
1. Provide 1/2”Tall Extruded PVC Moisture Guard: installed continuously at floor level of all gypsum drywall throughout building.
2. On all 2-Hour Rated walls and once the wall assembly is constructed, place a bead of sealant (latex, acrylic, silicone, polymer, or similar materials – not necessarily listed “fire caulk”) at floor level against the outer most layer of moisture guard on each side of the wall.
3. Height: 1/2 inch.
4. Depth: 5/8 inch.
5. Products:
a. Waterguard USA; Waterguard: www.waterguard-usa.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners at glass mat faced board assemblies.
2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
3. Joint Compound: Drying type, ready-mixed.

G. Finishing Compound: Surface coat and primer, takes the place of skim coating.

H. Textured Finish Materials: Latex- or Vinyl-based compound; plain.

I. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

J. 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.

K. For exterior applications provide bugle or wafer head, rust-resistant sharp point, fine thread for light-gauge metal framing or furring.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and as specified in Section 05 4000-Cold-Formed Metal Framing.

B. Blocking: Install supplementary framing, blocking and bracing for support of:
1. Framed openings.
2. Wall-mounted cabinets.
3. Plumbing fixtures.
4. Toilet partitions.
5. Toilet accessories.
6. Wall-mounted door hardware.
7. Heavy trim, furnishings or similar construction.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION - GENERAL

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Wall Tile shall be installed on Concrete Unit Masonry or Glass Mat Faced Tile Backer Board in toilet/shower rooms, around water fountains or other areas in which the tile might be exposed to moisture. If CMU is not provided in these areas, Glass Mat Faced Tile Backer Board shall be used. Wall tile to be installed on Glass Mat Faced Tile Backer Board where located in corridors.

C. FRP shall be installed on Glass Mat Faced Tile Backer Board in toilet rooms, janitor closets, around water fountains or other areas in which the tile might be exposed to moisture.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

F. Exterior Sheathing: Comply with GA-253 and ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
   1. Seal joints, cut edges, and holes with water-resistant sealant.
   2. Attach exterior sheathing to metal framing with screws spaced 8" o.c. at perimeter where there are framing supports; and 8" o.c. along intermediate framing in field. Do not counter sink.
   3. Locate fasteners minimum 3/8" from edges and ends of sheathing panels, tight against and flush with surface of sheathing.
   4. Immediately after installation, protect from weather by application of water-resistive barrier.

G. Installation on Metal Framing: Use screws for attachment of gypsum board.

H. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.05 BOARD INSTALLATION

A. Single Layer Gypsum Board on Metal Studs or ICF System.
   1. Loosely butt gypsum board joints together and neatly fit.
   2. Do not place butt ends against tapered edges.
   3. Maximum allowable gap at end joints: 1/8 inch.
   4. Stagger joints on opposite sides of partitions.
   5. Apply ceiling boards first where gypsum board ceilings and wall occur.
   6. Cut openings in gypsum board to fit electrical outlets, plumbing, light fixtures and piping snugly and small enough to be covered by plates and escutcheons. Cut both face and back paper.
   7. Screw board in place securely with screws spaced according to manufacturer's recommendations.
   8. At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.
   9. Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.

10. At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.
11. In all installations, gypsum wallboard shall be held above the finished floor a minimum of ½". Failure to comply with this requirement will be grounds for rejection and removal of the entire application.
12. Moisture resistant gypsum board shall be applied to cover the entire face of ICF and shall continue to the top of the ICF wall system at the floor or roof deck. At any instance where the lower portion of the ICF is covered with a different material that stops leaving the ICF foam exposed above, the cavity shall be closed with a gypsum cap or other alternative assembly and gypsum board applied to continue the coverage of the ICF to the floor or roof deck.

B. Single Layer Gypsum Board on Furring
1. Apply gypsum board with long dimension at right angles to furring channel.
2. Center end joints over channel web; stagger end joints from those in adjacent rows of board.
3. Fasten boards to furring channels with screws spaced according to manufacturer's recommendations.

C. Double Layer Gypsum Board
1. Fasten base layer to studs or furring with screws, and attach face layer using laminating adhesive and screws, applied according to manufacturer's instructions.
2. Offset face-layer joints at least 10 inches from parallel base-layer joints.
3. Screw both layers to metal supports at double layer ceiling applications and where required for fire-rated construction.

D. Single Layer Gypsum Board Suspended for Ceilings:
1. Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members.
2. Wallboard may be installed with the long dimension parallel to supporting members that are spaced 16" on centers when attachment members are provided at end joints.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints
1. Install control joints at junction of gypsum board partitions with walls or partitions of other finish material.
2. Install control joints within long runs of partitions at approximately 30'-0" on center or as indicated on the drawing.
3. Install control joints at bulkheads as shown on the drawings but in no case shall they exceed 15”-0” on center or as indicated on the drawing. Contractor shall be responsible to insure that bulkheads comply with this requirement and shall coordinate locations with the architect if not shown on the drawings.
4. Where gypsum board is vertically continuous, as at stairwells, provide horizontal control joints at each floor level.
5. Special Trim: Install as indicated on Drawings and in accordance with manufacturer's instructions.
6. Install control joints at each door jamb from head of door ceiling as shown on the drawings.
7. Do not install control joints behind any applied wall coverings.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Install metal casing bead trim whenever edge of gypsum board would otherwise be exposed or semi-exposed.

E. Special Trim and Reveal Joints: Install as indicated on Drawings and in accordance with manufacturer's instructions.

F. Moisture Guard Trim: Install on bottom edge of gypsum board according to manufacturer's instructions and in locations indicated on drawings.

3.07 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in GA-214 , ASTM C840, and as follows:
   1. Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.
   2. Level 2: Gypsum board substrate at tile, except remove tool marks and ridges.
   3. Level 3: Gypsum board surfaces, where textured finishes will be used.
   4. Level 4: Gypsum board surfaces scheduled to receive non-textured painted finishes, vinyl wall covering or custom covering is to be applied, except where another finish level is indicated.
   5. Level 5: Gypsum board surfaces scheduled to receive painted graphics or Dry-Erase Coating.

B. General:
   1. Inspect areas to be joint treated, verifying that the gypsum wallboard fits snugly against supporting framework.
   2. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees for 24 hours prior to commencing the treatment, and until joint and finishing compounds have dried.
   3. Apply the joint treatment and finishing compound by machine or hand tool.
   4. Provide a minimum drying time of 24 hours between coats, with additional drying time in poorly ventilated areas.
   5. Joint Treatment is required at all gypsum board walls including fire protection assemblies and ICF installations above the ceiling line.

C. Embedding compounds:
   1. Apply to gypsum wallboard joints and fastener heads in a thin uniform layer.
   2. Spread the compound not less than 3" wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then spread a thin layer of compound over the tape.
   3. After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than 6" wide at joints, and feather edged.
   4. Sandpaper between coats as required.
   5. When thoroughly dry, sandpaper to eliminate ridges and high points.

3.08 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions.

B. Texture Required: Unless shown or otherwise indicated on the drawings, provide medium “Orange Peel or Spatter Finish” texture on walls or ceilings.

3.09 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 2226
SUSPENSION SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 General Requirements, and Drawings are applicable to this Section.

B. Section Includes, but is not limited to:
   1. Metal suspension systems.
   2. Trim and accessories.

C. Related Sections:
   1. Section 05 4000 – Cold-Formed Metal Framing
   2. Section 09 2982 – Gypsum Board
   3. Section 09 5100 – Acoustical Ceilings
   4. Section 09 9000 – Painting and Coating

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A635 - Standard Specification for Sheet Steel.
   2. A641 - Standard Specification for Zinc-Coated Carbon Steel Wire
   3. C754 - Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
   4. C1002 - Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
   5. E119 - Standard Test Methods for Fire Tests of Building Construction and Materials

B. Association References:
   1. Gypsum Association GA 216, "Recommended Specifications for the Application and Finishing of Gypsum Board”
   2. Comply with "Specifications for Metal Lathing and Furring" published by the Metal Lath/Steel Framing Association.

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:
   1. Interior suspended ceilings and soffits: Maximum deflection of 1/360 of distance between supports.
   2. Exterior soffits: Withstand minimum positive and negative pressure of 20 psf with maximum deflection of 1/360 of distance between supports.
   3. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.

1.04 SUBMITTALS

A. Product Data: Submit product data sheets on the following materials. Data sheets shall be marked to indicate the product and sizes used.
   1. Metal Framing and Furring Materials

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Single Source Responsibility:
      a. Obtain metal framing from a single manufacturer.

B. Reference Standards:

1. Applicable requirements of ASTM C754 for installation of steel framing.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 – Product Requirements.

B. Acceptance at Site
   1. Deliver material to site promptly without undue exposure to weather.
   2. Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.

C. Storage and Protection
   1. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.
   2. Store above ground in dry, ventilated space.
   3. Protect materials from soiling, rusting and damage.

1.07 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
   2. Maintain illumination as required for proper installation of material.

1.08 WARRANTY

A. Comply with requirements of Section 01 7800 – Closeout Submittals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.

B. Suspension Systems:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. USG: www.usg.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CEILING AND SOFFIT SUPPORT MATERIALS

A. Hanger Anchorage Devices: Screws, clips, bolts or other devices compatible with indicated structural anchorage for ceiling hangers and whose suitability has been proven through standard construction practices or by certified test data.

B. Hangers
   1. Grade: Steel wire or rods, sizes to comply with requirements of ASTM C754 for ceiling or soffit area and loads to be supported.
      a. Wire: ASTM A 641, soft, Class 1 galvanized.
      b. Rods and flats: Mild steel components.
   2. Finish: Galvanized or painted with rust-inhibitive paint for interior Work; galvanized for exterior Work.

C. Framing System
   1. Grade: Framing system for gypsum board panels consisting of cold-rolled steel members conforming to ASTM C635.
   2. Finish: Exposed surfaces finished in manufacturer’s standard enamel paint finish.
   3. Fire Rating: Rating in accordance with U.L. assembly as indicated on the drawings.
   4. Components: Main tees, furring cross channels, furring cross tees, and cross tees.
      a. Main Tees: Heavy Duty classification 1-1/2” high x 144” long, integral reversible splice with knurled face. (Fire rated where required).

b. Cross Members: Members with knurled face. Cross Tees: 1-1/2” high x 48” long with 1-1/2” wide face; quick release cross tee ends for positive locking and removability without tools. (Fire rated where required).
c. Accessory Cross Tees: Cross tees must have knurled faces and quick release cross tee ends for positive locking and removability without tools.

5. Accessories:
a. U-shaped perimeter channel molding.
b. Galvanized carbon steel (12 ga.) hanger wire.

D. Hanger Wire Sound Isolators: Provide where indicated for sound-rated suspended ceilings.

E. Miscellaneous Accessories: Provide as required for complete installations.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install in accordance with reference standards and manufacturer's instructions.

B. Tolerances:
1. Do not exceed 1/8 inch in 8'-0" variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
2. Do not exceed 1/16 inch variation between planes of abutting edges or ends.
3. Shim as required to comply with specified tolerances.

C. Install framing to comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation.

3.02 EXAMINATION

A. Site Verification of Conditions:
1. Examine substrates and adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.03 INSTALLATION

A. Comply with provisions of Section 01 7000 – Execution and Closeout Requirements.

3.04 METAL SUPPORT INSTALLATION

A. Ceiling Support Systems
1. Secure hangers or rods to structural support by connecting directly to structure where possible; otherwise connect to inserts, clips or other anchorage devices or fasteners indicated.
2. Space main runners, hangers and furring according to requirements of ASTM C754, except as otherwise indicated.
3. Where spacing of structural members, or width of ducts or other equipment, prevents regular spacing of hangers, provide supplemental hangers and suspension members and reinforce nearest affected hangers to span extra distance.
4. Attach directly to structural elements only, do not attach to metal deck. Loop hangers and wire-tie directly or provide anchors or inserts.

3.05 ADJUSTING

A. Correct damage and defects which may telegraph through finished work.

B. Leave Work smooth and uniform.

3.06 CLEANING

A. Comply with requirements of Section 01 7000 – Execution and Closeout Requirements.

B. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scrap, debris, and surplus material of this Section.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking: Placement of special anchors or inserts for suspension system.

B. Section 07 2100 - Thermal Insulation: Acoustical insulation.

C. Section 08 3100 - Access Doors and Panels: Access panels.

1.03 REFERENCE STANDARDS

A. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

B. 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; 2017.

C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

D. CISCA (AC) - Acoustical Ceilings: Use and Practice; 1999.

E. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 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.

1.05 SUBMITTALS

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

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Manufacturer's certificate that products meet or exceed specified requirements.

H. Material Safety Data Sheets under provisions of Section 01 7800 - Closeout Submittals for the following items:
   1. All mastics, glues, and adhesives
   2. Acoustical ceiling tile

I. 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.

1.06 QUALITY ASSURANCE

A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL for the fire resistance indicated.

B. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer Qualifications: An entity experienced in the installation of acoustical ceiling systems similar to requirements for this Project, and acceptable to, or licensed by, acoustical ceiling systems manufacturer.

E. Comply with the following standards:
   1. CISCA (AC) "Acoustical Ceilings: Use and Practice."
   2. CISCA (AC) "Guidelines for Seismic Restraint Direct Hung Suspended Ceiling Assemblies."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 6000 – Product Requirements.

B. Deliver acoustical ceiling system components in manufacturer's original unopened packages or containers, with labels intact.

C. Store all components to provide suitable protection against deleterious effects from exposure to moisture, direct sunlight, or other causes.

D. Handle all components to preclude damage. Take special precaution to prevent damage to acoustical ceiling unit edges and corners.

E. Comply with manufacturer's Material Safety Data Sheets (MSDS) for delivery, storage, and handling of components.

1.08 FIELD CONDITIONS

A. Maintain uniform temperature of 60 - 85 degrees F, and maximum relative humidity of 70 percent prior to, during, and after acoustical unit installation.

B. Prior to installation, the following conditions must exist:
   1. All windows and exterior doors in place and roof watertight.
   2. Work of all wet trades completed and thoroughly dried to installation of any system components.
   3. Mechanical and Electrical trades shall have completed their work above ceiling line prior to acoustical ceiling systems installation. Coordinate with Mechanical and Electrical trades prior to start of installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. The manufacturer shall provide a minimum 15-year acoustical ceiling and suspension system warranty. Warranty shall warrant against ceiling tile sagging, warping and suspension grid rusting.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. Rockfon, LLC: www.rockfon.com
   4. USG: www.usg.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. Acoustical Tile Type I - Standard Panel: Painted mineral fiber, ASTM E 1264 Type III, Form 2, Sag Resistant Panels with the following characteristics:
   1. Size: 24 by 24 inches.
   2. Thickness: 5/8 inches.
   3. Composition: Water felted.
   4. Light Reflectance: Not less than 0.85 percent, determined in accordance with ASTM E1264.
   5. NRC Range: Not less than 0.55, determined in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): Not less than 33, determined in accordance with ASTM E1264.
   7. Edge: Square.
   8. Surface Color: White.
   9. Surface Pattern: CE (perforated, small holes and lightly textured)..
   10. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold and mildew.
   11. Products:
      a. Basis of Design: Fine Fissured 1728 as manufactured by Armstrong World Industries
      b. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01.
      c. Substitutions: See Section 01 6000 - Product Requirements.

B. Acoustical Tile Type IV - Foodservice Panel: Painted mineral fiber, ASTM E 1264 Type IX Form 2, Sag Resistant Panels with the following characteristics:
   1. Size: 24 by 24 inches.
   2. Thickness: 5/8 inches.
   3. Composition: Water felted.
   4. Light Reflectance: Not less than 0.89 percent, determined in accordance with ASTM E1264.
   5. Ceiling Attenuation Class (CAC): Not less than 33, determined in accordance with ASTM E1264.
   6. Edge: Square.
   7. Surface Color: White.
   8. Surface Pattern: G (smooth texture).
   9. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold and mildew.
   10. Products:
      a. Basis of Design: Kitchen Zone 673 as manufactured by Armstrong World Industries
      b. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01.
         1) Vinyl faced, gypsum core products are acceptable.
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Glass Fiber Acoustical Panels Type VI – Acoustical “Absorptive” Panel: painted faced glass fiber, ASTM E 1264 Type XII, Form 2, Sag Resistant Panels with the following characteristics:
   1. Size: 24 by 24 inches.

2. Thickness: 1-1/2 inches.
3. Light Reflectance: Not less than 0.90 percent, determined in accordance with ASTM E1264.
4. NRC Range: Not less than 1.00, determined as specified in ASTM E 1264.
5. Articulation Class (AC): Not less than 200, determined in accordance with ASTM E1264.
6. Edge: Square.
7. Surface Color: White.
8. Surface Pattern: E (fine texture).
9. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold and mildew.
10. Products:
    a. Basis of Design: Optima Lay-In 3159 as manufactured by Armstrong World Industries
    b. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01.
    c. 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 stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

B. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty.
1. Profile: Tee; 15/16 inch wide face, main tee 1-1/2 inch, cross tee 1-1/2 inch.
2. Construction: Double web.
3. Finish: White painted.
4. Products:
    a. Basis of Design for Non-Fire Rated Assemblies – Ceiling Types I, II, V, VI, VII and IX: "Prelude XL Galvanized Capped" as manufactured by Armstrong World Industries
    b. Basis of Design for Non-Fire Rated Assemblies – Ceiling Types III, IV: "Prelude XL Aluminum Capped" as manufactured by Armstrong World Industries
    c. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01. Ceiling Tile and Grid shall be as approved by the manufacturer.
    d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
1. Angle Hangers: ASTM A 446 steel with G90 coating.
2. Flat Hangers: Zinc-coated steel.
3. Hanger Rods: Zinc-coated steel.

B. Perimeter Moldings: Same material and finish as grid.
1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.

D. Touch-up Paint: Type and color to match acoustical and grid units.

E. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

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.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with UL design requirements ASTM C 636/C 636M, ASTM E 580/E 580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Main runners directly suspended by minimum 12 gage galvanized steel wire; hanger wire wrapped tightly a minimum three full turns.
   1. Runner Spacing: 4’-0”.
   2. Hanger Spacing: 4’-0”.

E. Main runners interconnected by cross-tees to form modules as shown on reflected ceiling plans. Suitable cross-tee lengths adjacent to recessed light fixtures on each side not supported by a main runner.
   1. Cross-Tee Spacing: 4’-0”.

F. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

G. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

H. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

I. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

J. Do not eccentrically load system or induce rotation of runners.

K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

L. Add extra ceiling wire at each corner of light fixtures and grilles.

M. Fire rated main runner/cross runner fire expansion relief cutout shall be evaluated for load performance where field application requires the expansion relief to be designed more than 3” from the closest support point.

N. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Install acoustical ceiling units from a three-carton mix to obtain uniform distribution of surface variations.

D. Fit border trim neatly against abutting surfaces.

E. Install units after above-ceiling work is complete.

F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

G. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

H. Sound walls: Set acoustical ceiling boards in four continuous beads of 1/4" diameter sealant, one at top of each edge of the gypsum drywall and two on top of the top metal runner track.

I. Install hold-down clips on each panel to retain panels tight to grid system at rated assemblies; comply with fire rating requirements.

3.04 ADJUSTMENTS

A. Make adjustments in ceiling system as necessary to ensure compliance with this specification.

B. Remove and replace damaged or soiled acoustical ceiling units.

3.05 CLEANING

A. Remove debris which may have been caused during installation of this work.

B. In addition to other stipulated requirements for cleaning, completely remove fingerprints and traces of soil from the surfaces of grid and acoustical materials, using only those cleaning materials recommended for the purpose by the manufacturer of the material being cleaned.

END OF SECTION

SECTION 09 6253
SYNTHETIC TURF FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. PLAE Attack Synthetic Turf Attack Rolls.

B. Adhesives

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied carpet.

1.03 REFERENCE STANDARDS

A. ASTM D5823- Standard Test Method for Tuft Height of Pile Floor Coverings

B. ASTM D1335- Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings

C. ASTM D5034- Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)

D. ASTM F1577- Standard Test Methods for Linear Density of Textile Fibers

E. ASTM D7138- Standard Test Method to Determine Melting Temperature of Synthetic Fibers

F. ASTM D5793- Standard Test Method for Binding Sites per Unit Length or Width of Pile Yarn Floor Coverings

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings.

C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

D. Samples: Submit three samples 12 by 12 inch in size illustrating color and pattern for each carpet material specified.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
   1. Instruct the owner's personnel in the care and maintenance of the flooring. Instruction and maintenance shall be performed by the flooring subcontractor and a representative of the flooring manufacturer. Refer to Section 01 7800 - Closeout Documents for additional requirements and information.
   2. The demonstration shall include written guidelines for the proper equipment, operation, materials and manufacturers recommended schedule of maintenance. See Section 01 7900 - Demonstration and Training for additional information.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional requirements.
   2. Extra Carpet: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum five years documented experience.

B. Installer Qualifications: Company specializing in installing carpet with minimum five years documented experience.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

D. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace tile that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: Eight (8) years from the date of manufacturing warrants against manufacturing defects and also guarantees for a period of eight (8) years not to fade or fail (as distinguished from textural change) or decrease in pile height over 50 percent as a result of UV degradation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Synthetic Turf Flooring:
   1. PLAE: www.plae.us
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SYNTHETIC TURF FLOORING

A. Basis of Design: PLAE; Attack 5mm Turf Flooring

B. General: PLAE Attack 5mm Foam Backing consisting of 14mm Fiber Pile Height with a 5mm Urethane Foam Backing

C. Performance:

1.	Pile Height (Nominal):	0.75in
2.	Face Weight:	48oz /sq. yard
3.	Total Fabric Weight:	135oz/sq.yard
4.	Primary Backing Weight:	70oz /sq. yard
5.	Secondary Coating Weight:	80oz /sq. yard
6.	Tuft Bind:	Greater than 8lbs.
7.	Grab Tear Strength (Average):	Greater than 200lbs.
8.	Lead Content:	Less than 50ppm
9.	Total Yarn Linear Density:	5,400 Denier
10.	Elongation to Break:	Greater than 60 percent
11.	Yarn Breaking Strength:	Greater than 19lbs
12.	Yarn Melting Point:	248 ºF
13.	Stitch Rate:	3in
14.	Machine Gauge:	3 / 16in
15.	Flammability:	Passed
16.	Fiber Thickness (Primary/Secondary):	3.9mils
17.	Fabric Width:	15'

2.03 ADHESIVE:

A. Basis of Design: PLAE; Anchor Two Part Urethane Adhesive:
   1. Material: Anchor is a two-component urethane moisture cured, non-sag permanently elastic adhesive that has excellent adhesion to elastomers, concrete, and wood and is engineered for indoor and outdoor applications.
   2. Adhesive Type: Two component urethane
   3. Adhesive Cure System: Moisture cured
   4. Color: Part A-Green, Part B-Dark Brown
   5. Relative Humidity (RH) Test: 100%
   6. Coverage Rate: up to 130 sf/gal

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesives to sub floor surfaces.

C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

C. Clean substrate.

3.03 INSTALLATION

A. Surface Preparation: Refer to manufacturer's recommended installation details and requirements for subfloor preparation.

B. The surface to receive the synthetic turf shall be inspected and certified by the turf manufacturer as ready for the installation of the synthetic turf system and must be perfectly clean as installation commences and shall be maintained in that condition throughout the process.

C. Only factory-trained technicians, skilled in the installation of athletic caliber synthetic turf systems working under the direct supervision of the synthetic turf manufacturer’s installation supervisors shall undertake the placement of the system.

D. The Turf Project Superintendent shall thoroughly inspect all materials delivered to the site for both quality and quantity to assure that the entire installation shall have sufficient materials to maintain the schedule and proper mixing ratios.

E. Weather/climatic conditions may be a factor in delay of installation, but shall not warrant the accrual of additional liquidated damages. Should the ambient outdoor temperature fall below 45 degrees Fahrenheit, the Turf Contractor and Owner will discuss available options and/or stoppage of work. However, the final decision shall be at the Turf Contractor’s discretion.

3.04 FIELD MARKINGS AND DECORATIONS

A. Field markings and decorations shall be installed in accordance with approved project shop drawings

3.05 CLEANING

A. Remove excess adhesive from floor and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

C. Provide a heavy non-staining paper or plastic walkway as required over carpeting in direction of traffic, maintaining intact until carpeted space is accepted by the Owner.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 09 6566
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vinyl sheet flooring, adhesively installed.

B. Painted game lines.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2021.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.
   1. Include samples of game lines, illustrating colors selected.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Minimum ten (10) years experience in manufacturing of specified flooring.

B. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace flooring that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Aacer Sports Flooring; www.aacerflooring.com.
   2. Connor Sports Flooring: www.connorfloor.com.
   3. Mondo Sports and Flooring: www.mondousa.com.
   4. Robbins Sports Surfaces: www.robbinsfloor.com/#sle.
   5. Taraflex Sports Flooring: www.gerflorusa.com.
   6. Omnisports; Tarkett: www.tarkettsportsindoor.com
   7. Dynamic Sports Construction Inc: www.dynamicsportsconstruction.com.
   8. Substitutions: See Section 01 6000 - Product Requirements.

B. Vinyl Sheet Flooring:
   1. Basis of Design: Taraflex Multi-Use 6.2 and Sport M Plus manufactured by Gerflor North America. See Section 01 6210 for locations.
   2. Wearing Surface: Pure polyvinyl chloride, mechanically extruded and uniformly resilient material with uniform color throughout thickness.
   3. Backing: Very high density, closed cell foam with reinforced fiberglass grid.
   4. Sheet Thickness: 6.2/7.5 mm.
   5. Sheet Width: Minimum 59 inches.
   6. Sheet Lengths: As necessary to minimize transverse seams.
   7. Seaming Method: Welding with heat or chemical.
   8. Color: Refer to Section 01 6210 Schedule of Materials and Colors.
   9. Game Lines: Paint as approved by manufacturer of vinyl sheet flooring.

2.02 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

C. Where the moisture-vapor-emission rate exceeds the manufacturers allowable rate provide and install a moisture mitigating primer as reccommended by the manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. 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 athletic flooring to substrate.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
   1. Test in accordance with ASTM F710.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

C. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Comply with manufacturer's recommendations and approved shop drawings.

B. Resilient Sheet Flooring:
   1. Unroll flooring and allow to relax before beginning installation.
   2. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
   3. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
   4. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
   5. Weld seams using techniques and equipment recommended by manufacturer.
   6. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.
   7. Apply transparent top coat over flooring if recommended by manufacturer, to achieve a uniform finished appearance.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

C. If it becomes necessary to move any heavy fixtures or appliances over the flooring on casters or dollies, the flooring should be protected with 1/4" or thicker plywood, hardboard or other underlayment panels. If other on-site work is continuing, use a protective covering such as plain, undyed kraft paper to guard against damage to the new floor.

END OF SECTION

SECTION 09 7200
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation .

B. Wall covering .

1.02 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes; 2002 (Reapproved 2013).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

1.03 SUBMITTALS

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

B. Product Data: Provide data on wall covering and adhesive.

C. Shop Drawings: Indicate wall elevations with seaming layout.

D. Samples: Submit two samples of wall covering, 6 x 6 inch in size illustrating color, finish, and texture.

E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

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 Wall Covering Materials: 25 linear feet of each color and pattern of wall covering; store where directed.
   3. Package and label each roll by manufacturer, color and pattern, and destination room number.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.05 MOCK-UP

A. Locate where directed.

B. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturers:
   1. Forbo Flooring Systems: www.forbo.com
   2. Koroseal/RJF International: www.koroseal.com.
   3. MDC Wallcoverings: www.mdcwall.com.
   4. Tri-Kes/Source One: www.tri-kes.com.

2.02 WALL COVERINGS

A. General Requirements:
   1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
   2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.
   3. All vinyl wallcoverings located on exterior walls shall be micro-perforated for permeability.

B. Cork Wall Covering:
   1. Uni-color resilient homogeneous tackable linoleum surface consisting of linseed oil, granulated cork, rosin binders, and dry pigments calendered onto natural burlap backing.
   2. Color shall extend through thickness of material.
   3. Width: 48 inch
   4. Gauge: 1/4 inch
   5. Flexible enough to bend around a 2-3/4 inch radius
   6. Product and Color: See Section 01 6210 - Schedule of Materials and Colors.

C. Adhesive: Mold and mildew resistant. Type recommended by wall covering manufacturer to suit application to substrate.

D. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

E. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work, and conform to requirements of the wall covering manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.

E. Marks: Seal with shellac those that may bleed through surface finishes.

F. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

G. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering.

C. Use wall covering in roll number sequence.

D. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.

E. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

F. Horizontal seams are not acceptable.

G. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

H. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

I. Do not install wall covering more than 1/4 inch below top of resilient base.

J. Cover spaces above and below windows, above doors, in pattern sequence from roll.

K. Apply wall covering to electrical wall plates prior to replacing.

L. Wall covering is required behind fin tube cabinets.

M. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.

N. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

SECTION 09 7213
MARKABLE WALL SURFACING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Aluminum Dry Erase Wallcovering
   1. Magnetic Receptive Dry Erase Wallcovering.
   2. Tray, Trim, and Presentation Rails.
   3. Accessories.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM) E84 Test Method for Surface Burning Characteristics of Building Materials.

B. Gypsum Association GA-14-M-97 Recommended Levels of Gypsum Board Finish.

1.03 SUBMITTALS

A. Manufacturer's product data and installation instructions for each type of dry erase wallcovering, adhesive, and accessories required.

B. Manufacturer's written product data indicating compliance with specified materials required.

C. Manufacturer's written installation instructions.

D. Manufacturer's written instructions for recommended maintenance of each type of dry erase wallcovering required.

E. Samples
   1. 7 x 9 inch (18 x 23 centimeter) samples of each dry erase material required.
   2. 6 inch (15 centimeter) samples of trim, tray, and end caps required.

1.04 QUALITY ASSURANCE

A. Manufacturer: Provide each type of dry erase wallcovering required produced by one manufacturer.

B. Installer: Installation by skilled commercial wallcovering contractor with no less than three years of documented experience installing dry erase wallcovering of the types and extent required.

C. Surface Burning Characteristics Classification: Provide materials that meet Class I/A rating when tested in accordance with ASTM E84 for flame spread and smoke developed.

D. Field Samples: Prepare field samples for architect's review and establish requirements for seaming and finish trim.
   1. Install sample panel of each type presentation wallcovering specified in area designated by Architect.
   2. Maintain corrected and approved samples to serve as a standard of performance for the project.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver presentation wallcoverings to the project site in unbroken and undamaged original factory packaging and clearly labeled with the manufacturer's identification label, quality or grade, and lot number.

B. Store materials in a clean, dry storage area with temperature maintained above 55° F (13° C) with normal humidity.

C. Store material within original packaging to prevent damage.

1.06 PROJECT CONDITIONS

A. Do not apply presentation wallcoverings when surface and ambient temperatures are outside the temperature ranges required by the wallcovering manufacturer.

B. Provide continuous ventilation and heating facilities to maintain substrate surface and ambient temperatures above 55° F (13° C) unless required otherwise by manufacturer's instructions.

C. Apply adhesive when substrate surface temperature and ambient temperature is above 55° F (13° C) and relative humidity is below forty percent.

D. Maintain constant recommended temperature and humidity for at least seventy-two hours prior to and throughout the installation period, and for seventy-two hours after wallcovering installation completion.

E. Provide not less than 80-foot-candles per square foot lighting level measured mid-height at substrate surfaces.

1.07 WARRANTY

A. Submit manufacturer's limited five-year written warranty against manufacturing defects.

1.08 MAINTENANCE

A. Maintenance instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Koroseal/RJF International: www.koroseal.com.

B. Kenmark Interiors: www.gokenmark.com

C. MooreCo, Inc: www.moorecoinc.com.

D. Write Walls Dry Erase Wallcovering: www.writewalls.global.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ALUMINUM DRY ERASE WALLCOVERING

A. Panelized Writing Surface Facing Sheet:
   1. Basis of Design: MooreCo, Inc, Sharewall Spline Full Wall Magnetic Whiteboard
   2. Shall be enameling grade cold rolled steel, .016" thick for all pre-framed boards without joints.
   3. All enameling grade steel shall be coated with a ground coat on the face and back surface and a smooth finish coat on the face, free from defects or orange peel texture:
      a. Marker boards shall have a 91 to 97 percent gloss (high gloss surface)
      b. Facing sheet coatings:
         1) 1.7-2.5 mils enameled ground coat on face minimum thickness.
         2) 3.0 – 4.0 mils enameled cover (color) coat for marker board.
         3) 1.7-2.5 mils enameled minimum ground coat on back of facing.
         4) Firing temperatures shall be 1475-1500 degrees minimum for marker boards.
         5) Color(s): As selected by the Architect from the manufacturer’s range of standard colors.
   4. Writing Surface Core: 7/16" thick MDF board.
      a. Maximum panel length is 12'-0" in one piece.
   5. Panel shall have a foil vapor barrier backer.
   6. Lamination:
      a. Factory machine type PUR “hot glue” only.
      b. Tested per ASTM D 1183 as modified by National Starch & Chemical for glue bonds on Marker boards.
   7. Trim:
      a. All trim shall be 6063 alloy grade aluminum with minimum T5 tempering treatment and shall receive type 201-R1 satin anodized finish.

b. Trim at ends of writing units and at perimeter to be # 45 “J” type trim with a minimum face width of .5” Designed to be fastened directly to the wall with screws.
c. Splines at joints between panels shall be #AL-SP aluminum “H” profile aluminum spline designed to be fastened directly to the wall with screws to prevent bounce at the center of the panels.

8. Fabrication:
   a. General: In accordance with PEI-1002.
   b. Lamination: Use factory machines only, designed and tested for the application of foam tape to thin substrate.
   c. Trim:
      1) Factory cut and predrill perimeter trim to allow hairline joints at corners.
      2) Field applied trim to attach directly to wall without visible fasteners.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and installation conditions to ensure surface conditions meet or exceed a Level 4 finish, per GA-214-M-97: Recommended Levels of Gypsum Board Finish, and permanent lighting should be installed and operational.

B. Test substrate with a suitable moisture meter and verify that moisture content does not exceed four percent.

C. Verify substrate surface is clean, dry, smooth, structurally sound, and free from surface defects and imperfections that would show through the finished surface.

D. Evaluate all painted surfaces for the possibility of pigment bleed-through.

E. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation.

F. Beginning of installation means acceptance of surface conditions.

3.02 INSTALLATION

A. Acclimate wallcovering in the area of installation a minimum of twenty-four hours before installation.

B. Read and follow the manufacturer's installation instruction sheet.

C. Examine all materials for pattern, color, quantity and quality, as specified for the correct location prior to cutting.

D. Adhesive: Apply a uniform coat of heavy-duty pre-mixed clay-based or extra strength clear wallcovering adhesive.

E. Primer: Use a quality pigmented acrylic wallcovering primer.

F. Install each strip horizontally and in the same sequence as cut from the roll.

G. Install dry erase wallcovering sheets in exact order as they are cut from bolt. Reverse hang alternate strips (except lined products). Do not crease or bend the wallcovering when handling.

H. Install dry erase wallcovering horizontally using a level line.

I. Using a level or straight edge, double cut the seam with a seam-cutting tool (Ex: Double seam-Cutter or Swedish Knife). Do not score drywall or plasterboard when cutting material.

J. When covering the entire wall, seam the material out of the main writing and viewing areas of the wall.

K. Apply wallcovering to the substrate using a wallcovering smoother, wrapped with a soft cloth, to remove air bubbles. Do not use sharp edged smoothing tools. Smooth material on the wall from the middle to the outside edge.

L. Remove excess adhesive immediately after the wallcovering is applied. Clean entire surface with a warm mild soap solution, and clean soft cloths. Rinse thoroughly with water and let dry before using. Change water often to maintain water clarity.

M. Stop installation of material that is questionable in appearance and notify the manufacturer's representative for an inspection.

3.03 CLEAN-UP

A. Upon completion of installation, remove all exposed adhesive immediately using a soft cloth and a warm, mild soap solution and rinse thoroughly with water and dry with clean towel prior to using.

B. Upon completion of the work, remove surplus materials, rubbish, and debris resulting from the wallcovering installation. Leave areas in neat, clean, and orderly condition.

END OF SECTION

SECTION 09 7223
CUSTOM DIGITAL WALL COVERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Custom Digital Wall Covering.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry

B. Section 09 2982 - Gypsum Board

1.03 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes; 2002 (Reapproved 2013).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

C. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2020.

1.04 SUBMITTALS

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

B. Product Data: Provide data on wall covering and adhesive.

C. Shop Drawings: Indicate wall elevations with seaming layout.

D. Samples: Samples and strike-offs shall be sent to the Architect/Designer and Owner for final approval.

E. No product shall be fabricated or installed without signature and approval of the Owner.

F. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.

G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention. All special instructions shall be provided by the Manufacturer to the Contractor.

H. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Provide final digital print files, shop drawings and product data for Owner's use.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

C. Applicator Qualifications: Work of this section shall be performed by a firm regularly engaged in the installation of environmental graphics of the types and qualities specified, coordinated by Manufacturer/Contractor, and acceptable to the Architect/Designer.

D. Field verifications/dimensions shall be sent to the General Contractor and coordinated with the Installer and Manufacturer before any artwork is to be printed or executed. Graphics company shall coordinate a trip with the contractor to the site to pre-measure walls prior to the release of any material.

E. Color match on graphic prints may have some slight variability due to printer and monitor calibration.

1.06 MOCK-UP

A. Locate where directed.

B. Mock-up may remain as part of the Work.

C. Architect/Designer may provide additional drawings to clarify design intent if required.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 CUSTOM DIGITAL WALL COVERING

A. Custom Digital Wall Covering:
   1. Digital wall covering shall be certified 20 oz. (457g/m2) Type II, Class "A" vinyl for solvent, eco-solvent, UV curable and latex inks.
      a. Basis of Design: See Section 01 6210 - Schedule of Materials and Colors for product selection.
      b. Manufacturers:
         1) Building Image Group: www.buildingimagegroup.com
         2) MDC Wallcoverings: www.mdcwall.com.
         3) Reprographic Consultants: www.reprocon.com
         4) Riot Creative Imaging: www.riotcolor.com
         5) Tri-Kes/Source One: www.tri-kes.com.
         6) Waterboy Graphics: www.waterboygraphics.com
         7) Substitutions: See Section 01 6000 - Product Requirements.
   2. Physical Properties
      a. Width: 54" or 60"
      b. Product Weight: 20 oz. per lineal yd. (13oz. per sq. yd.)
      c. Vinyl Weight: 17 oz. per lineal yd.
      d. Fabric Weight: 3 oz. per lineal yd.
      e. Thickness: 0.017 to 0.027 depending on texture
      f. Fabric: Woven Poly Cotton Osnaburg
   3. Tensile Strengths
      a. Warp - Exceeds Type II minimum of 50 lbs.
      b. Fill - Exceeds Type II minimum of 55 lbs.
   4. Tear Strengths
      a. Warp - Exceeds Type II minimum of 25 lbs.
      b. Fill - Exceeds Type II minimum of 25 lbs.
   5. Fire Testing
      a. Meets or exceeds requirements for flame spread, smoke developments and flashover
      b. ASTM-E84 Tunnel Test: Class A
      c. NFPA286 Corner Burn Test: Class A
      d. NFPA265 Corner Burn Test: Class A
   6. Mold/Mildew/Bacterial Resistance

a. ASTM-G21: Passed all requirements of CCCW-408-D

7. Color Mode and Image Resolution: All images and files shall be submitted and printed in CMYK color mode. Image resolution for offset and digital print shall be 300 DPI at final size. Image resolution for wide format print shall be minimum 125 DPI at final size.
8. All vinyl wall coverings located on exterior walls shall be micro-perforated for permeability.

B. Accessories
1. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
2. Termination Trim: Extruded plastic, color as selected.
3. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
4. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work, and conform to requirements of the graphics manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

D. Upon discovery of unacceptable conditions, including but not limited to, finish level, light swithces, outlet covers, supply/return grills and any other obstructions within the graphic area, the installer will notify the client and Architect/Designer and not proceed until the conditions are acceptable. Starting installation constitutes acceptance of surface conditions.

3.02 PREPARATION

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.

E. Marks: Seal with shellac those that may bleed through surface finishes.

F. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

G. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering. Let contact adhesive set tack free.

C. Use wall covering in roll number sequence.

D. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.

E. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface. Butt edges tightly.

F. Horizontal seams are not acceptable.

G. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

H. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

I. Do not install wall covering more than 1/4 inch below top of resilient base.

J. Cover spaces above and below windows, above doors, in pattern sequence from roll.

K. Before cutting, field install to layout environmental design elements in accordance with submittal drawings and any additional design intent drawings provided by Architect/Designer for installation reference. Examine each element for color consistency, accuracy, and proper design dimension.

L. Request inspection by the Architect/Designer if there are variations in color, pattern, or design that are considered to be excessive.

M. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.

N. Install termination trim.

O. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

A. Do not permit construction activities at or near finished graphics areas.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

A. Related Documents: General and Supplementary Conditions of the Contract, Division 01 General Requirements, and Drawings are applicable to this Section.

B. Section Includes, but is not limited to:
   1. Exterior paints and coatings systems including; paints, stains, transparent coatings, and opaque finishes.
   2. Interior paint and coatings systems including; paint, stains, transparent coatings, and opaque finishes.
   3. Specific products and painting scheduled in this Section are based, in general, on products of Sherwin-Williams Company (noted SW). Products of other manufacturers listed in paragraph 2.01 may be substituted with approved color matches.

1.02 RELATED SECTIONS

A. Section 05 2100 - Steel Joist Framing: Shop priming

B. Section 05 5000 - Metal Fabrications: Shop priming

C. Section 06 2000 - Finish Carpentry: Back priming of trim and paneling

D. Section 07 8123 - Intumescent Fire Protection: Field-applied paints coordination with intumescent fireproofing substrate.

E. Division 23 - Mechanical Identification: Markers and color-coding

F. Division 26 - Electrical Identification: Markers and color-coding

1.03 REFERENCES

A. Industry Association Standards
   1. SSPC-SP 1 - Solvent Cleaning.
   2. SSPC-SP 2 - Hand Tool Cleaning.
   3. SSPC-SP 3 - Power Tool Cleaning.
   4. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

1.04 DEFINITIONS

A. Paint
   1. Means coating systems materials including primers, emulsions, epoxy, enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.05 SUBMITTALS

A. Shop drawings, product data, and samples under provisions of Section 01 3000 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each paint and coating product should include:
   1. Product characteristics
   2. Surface preparation instructions and recommendations
   3. Primer requirements and finish specification
   4. Storage and handling requirements and recommendations
   5. Application methods
   6. Cautions

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's color samples available.

D. Verification Samples: For each finish product specified, submit 8”x10” samples that represent actual product, color, and sheen.

E. Closeout Submittals
   1. Submit under provisions of Section 01 7800 - Closeout Submittals.
   2. Upon conclusion of the project, the Contractor or paint manufacture/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touchup procedures, and color samples of each color and finish used.

1.06 QUALITY ASSURANCE

A. Qualifications
   1. Single Source Responsibility:
      a. Obtain each type of material required from single source.

B. Pre-installation Meetings
   1. Comply with provisions of Section 01 3000 - Administrative Requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 - Product Requirements.

B. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information:
   1. Product name, type (description)
   2. Application and use instructions
   3. Surface preparation
   4. VOC content
   5. Environmental issues
   6. Batch date
   7. Color number

C. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

D. Store materials in an area that is within the acceptable temperature range, per manufacturers instructions. Protect from freezing.

E. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.08 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

1.09 MAINTENANCE

A. Extra Materials
   1. At completion of project, deliver to Owner extra stock of materials used on project as follows:
      a. Elementary/Intermediate School - Ten (10) gallons for each field color/type, three (3) gallons for trim and accent of each color/type.
   2. Store in location as directed by Owner.
   3. Ensure containers are sealed and identified by manufacturer, type, and color.
   4. Submit maintenance data under provisions of Section 01 7800 - Closeout Submittals.

5. Include cleaning methods, and recommended cleaning solutions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.

B. Sherwin-Williams Co.: www.sherwin-williams.com.

C. PPG Paints: www.ppgpaints.com

D. Benjamin Moore & Co.: www.benjaminmoore.com.

E. Substitutions: Under provisions of Section 01 6000 - Product Requirements.

2.02 MATERIALS - GENERAL

A. Paints and Coatings - General:
   1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
   2. 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.

B. Primers:
   1. Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Compatibility with other materials:
   1. Topcoats: Suitable for application over applied intumescent coatings; of type recommended in writing by intumescent coatings manufacturer for each fire resistance design. Topcoat to have been tested by manufacturer for compatibility in fire conditions with documentation of such tests to be provided upon request. Color of topcoat shall be as selected by the architect. Colors shall not be limited to manufacturer's standard colors.
   2. See Section 07 8123 - Intumescent Fire Protection for additional information.

2.03 COLOR SCHEDULES

A. See color schedule on the drawings and Section 01 6210 - Schedule of Materials and Colors.

B. The Architect may select, allocate, and vary colors on different surfaces throughout the Work, subject to the following.
   1. Exterior work: A maximum of three (3) different colors will be used, with variations for trim, doors, miscellaneous work, and metal work.
   2. Interior work: A maximum of ten (10) different pigmented colors will be used, with variations for trim and wall surfaces and wainscots.
   3. Dark tones: A maximum of five (5) dark tones will be used as accent colors for interior.

C. All painted graphics shown on the drawings shall be included in the base proposal and shall be included in this section. Contractor shall note that school colors and mascot may be released after initial color selection. Contractor shall make all necessary adjustments.

2.04 MISCELLANEOUS MATERIALS

A. Coating Application Accessories
   1. Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required per manufacturer's specifications.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin application of coatings until substrates have been properly prepared. Notify Architect of unsatisfactory conditions before proceeding

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Proceed with work only after conditions have been corrected, and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

3.02 PREPARATION

A. Comply with provisions of Section 01 7000 - Execution and Closeout Requirements.

B. The surface must be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

C. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

D. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50°F, unless products are designed specifically for these conditions.

E. Methods:
   1. Concrete Masonry Units
      a. 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. Concrete and mortar must be cured at least 30 days at 75°F. The pH of the surface should be between 6 and 9, unless the products to be used are designed to be used in high pH environments such as Loxon. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.
   2. Concrete, SSPC-SP13 or NACE 6
      a. This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.
   3. Drywall-Interior
      a. Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.
   4. Galvanized Metal
      a. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

5. Steel: Structural, Plate, Doors and Frames, etc.
    a. Should be cleaned by one or more of the surface preparations described below. All metal shall be thoroughly prepared to ensure adhesion of new paint to the prepared surface. All prepared surfaces shall be observed and approved by the Owner or Owners Representative before new paint is applied.
    b. Solvent Cleaning, SSPC-SP1
        1) Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
    c. Hand Tool Cleaning, SSPC-SP2
        1) Hand Tool Cleaning removes all loose mill scale, loose rust and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
    d. Power Tool Cleaning, SSPC-SP3
        1) Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
6. Stucco
    a. Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9, unless the products to be used are designed to be used in high pH environments such as Loxon.
7. Wood-Exterior
    a. Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.
8. Wood-Interior
    a. All finishing lumber and flooring must be stored in dry, warm rooms to prevent absorption of moisture, shrinkage, and roughening of the wood. All surfaces must be sanded smooth, with the grain, never across it. Surface blemishes must be corrected and the area cleaned of dust before coating.

3.03 APPLICATION

A. Comply with provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Testing: Due to the wide variety of substrates, preparation methods, application methods and environments, one should test the product in an inconspicuous spot for adhesion and compatibility prior to full-scale application.

C. Apply all coatings and materials with manufacture specifications in mind. Mix and thin coatings according to manufacture recommendation.

D. Do not apply to wet or damp surfaces.
    1. Wait at least 30 days before applying to new concrete or masonry. Or follow manufactures procedures to apply appropriate coatings prior to 30 days.
    2. Test new concrete for moisture content.
    3. Wait until wood is fully dry after rain or morning fog or dew.

E. Apply coatings using methods recommended by manufacturer.

F. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

G. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

H. Regardless of number of coats specified, apply as many coats as necessary for complete hide.

I. All drywall installation areas shall be made ready for painting by first preparing the gypsum wallboard surfaces with texturing as specified. Apply in strict compliance with manufacturer's written directions. Omit texturing where wall carpet occurs, reference Finish Schedule on drawings.

J. At gymnasiums, contractor shall paint wood blocking for gym equipment supports to match adjacent color. Contractor shall coordinate the sequencing with all trades.

K. Exterior Woodwork: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 2 weeks.

L. Miscellaneous surfaces and procedures
   1. Exposed mechanical items
      a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, and items of similar nature to match the adjacent wall and ceiling surfaces, or as directed.
      b. Paint visible duct surfaces behind vents, registers, and grilles Sherwin Williams Pro Mar Flat Black.
      c. Wash metal with solvent, prime, and apply two coats of alkyd enamel.
   2. Exposed pipe and duct insulation
      a. Apply one coat of latex paint on insulation which has been primed under other Sections; apply two coats on such surfaces when unprepared.
      b. Match color of adjacent surfaces.
      c. Remove band before painting, and replace after painting.
   3. Hardware: Paint prime coated hardware to match adjacent surfaces.
   4. Wet areas
      a. In toilet rooms and contiguous areas, add an approved fungicide to paints.
   5. Exposed vents: Apply two coats of heat-resistant paint approved by the Architect.

M. Inspection: The coated surface must be inspected and approved by the architect just prior to each coat.

3.04 REPAIR/RESTORATION

A. For surfaces that are to receive new finish, prepare surface and apply materials as described below and per manufacture recommendation.

B. Preparation of Existing Surfaces That Have Been Previously Painted or Varnished:
   1. The workmanship shall be best quality, and the surface shall be prepared in a thorough manner in order that the new finish shall be as finished as if the surface had been new with all the usual preparation for new paint or varnish.
   2. All previously painted or varnished surfaces or surfaces that have been previously finished in any manner shall first be prepared to receive new finish or any sort, according to the following specifications:
      a. Existing painted sand finish plaster walls to be repainted
         1) Remove all scaled or loose paint.
         2) Fill all cracks in plaster as follows:
            (a) Large cracks - caulk with latex sealant.
            (b) Hairline cracks - Add 1 lb. of taping cement to 1 gallon of latex paint and brush across cracks until filled.
      b. Existing enamel or varnished surfaces on smooth plaster or any surface

1) Add 4 tablespoons of Tri-Sodium Phosphate per quart of paint thinner and wash surfaces to be repainted not less than 4 hours nor more than 7 hours before painting first coat.

c. Existing drywall partitions to receive new base.
1) Upon removing existing rubber base, prepare wall surface to receive new base. Surface shall be leveled to meet adjacent surface. Texture wall as required to match existing.

C. Painting Existing Surfaces after Surfaces Have Been Prepared
1. Sand Finish Plaster
a. One coat primer-sealer colored to match finish coat. Primer-sealer will be SW ProMar 200 Zero VOC Interior Latex Primer, B28W12600.
b. One coat of paint shown on schedule or two coats if required to fully cover for first quality finish.
2. Concrete Masonry Units
a. Same as sand finish plaster.
3. Smooth Plaster Walls
a. One coat SW ProMar 200 Zero VOC Interior Latex Primer, B28W12600.
b. Second coat will be as directed by the Architect.
4. Varnished Surfaces to be Revarnished
a. Repair scratches with SW Wiping Stain, S64 series.
5. Enameled Trim:
a. Apply one coat SW Premium Wall & Wood Primer, B28W8111.
b. Second coat will be as directed by the Architect.
6. Hollow Metal Trim (Existing)
a. Same as enamel trim.

3.05 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

PART 4 - SCHEDULES

4.01 GENERAL

A. The Painting Schedule of this Section is based, in general, on products of Sherwin-Williams Company (noted SW on the schedule).

B. Where painting occurs in addition or renovation projects provide low odor finishes equal to Sherwin Williams ProMar 200 Zero VOC Series.

C. The various surfaces and areas receiving finishes maybe indicated on the drawings or as noted below. The desired finishes are shown by code numbers. Not all codes listed below may be used. The required materials for each code number shown on the finish schedule are specified below under the corresponding code numbers.

4.02 PAINTING SCHEDULE

A. Code 100a - Exterior Metal
1. Including flashing, vents, doors, window trim and grilles (except aluminum, other non-ferrous metals, and galvanized metal)
2. 1st Coat: SW Pro Industrial ProCryl Universal Primer, B66-1300 series.
3. 2nd/3rd Coat: SW Pro Industrial WB Alkyd Urethane Enamel Semi-Gloss, B53-2150/5150 series.

B. Code 100b - Exterior Metal

1. Including aluminum and galvanized metals
2. 1st/2nd Coat: SW Pro Industrial ProCryl Universal Primer, B66-1310 series.
3. 3rd/4th Coat: SW Pro Industrial Acrylic Semi-Gloss, B66-650 series.

C. Code 100c - Exterior Metal
1. For use on exterior painted handrails and exposed structural steel over properly prepared steel (SSPC SP-6 Commercial Metal Blast, 2-3 mil profile).
2. 1st Coat: SW Macropoxy 646 FC Epoxy B58 series.
3. 2nd/3rd Coat: Sher-Loxane 800 Two Component Polysiloxane Semi-Gloss or Gloss finish.

D. Code 101 - Exterior Wood
1. Including wood doors, screens and trim
2. 1st Coat: SW Exterior Latex Waterbased Wood Primer, B42W8141.
3. 2nd/3rd Coat: A-100 Exterior Acrylic Satin, A82-series.

E. Code 102a - Exterior CMU
1. 1st Coat: SW PrepRite Block Filler, B25W25.
2. 2nd/3rd Coat: SW A-100 Exterior Acrylic Satin, A82-series

F. Code 102b - Exterior Cement Board
1. 1st Coat: SW Loxon Concrete & Masonry Primer-Sealer, LX2W50.
2. 2nd/3rd Coat: A-100 Exterior Acrylic Satin, A82-series.

G. Code 103 - Interior Wood (Natural Wood)
1. 1st/2nd/3rd Coat: SW Gallery Series Waterborne Topcoat, 20 Gloss, B52F00020 Satin (Clear) – *spray application*

H. Code 104a - Interior Wood (Painted Surface, Enamel):
1. 1st Coat: SW Premium Wall & Wood Primer, B28W8111.
2. 2nd/3rd Coat: SW Pro Industrial Waterbased Alkyd Urethane Enamel, Semi-Gloss, B53-2150/5150 series.

I. Code 104b - Interior Metal (Painted Surface, Enamel)
1. 1st Coat: ProCryl Universal Primer, B66-1300 series.
2. 2nd/3rd Coat: SW Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-2150-5150 series.

J. Code 105 - Interior Wood (Stain & Finish)
1. 1st Coat: SW Sher-Wood Wiping Stain, S64 series. (color as selected by Architect)
2. 2nd/3rd Coat: SW Gallery Series Waterborne Topcoat, 20 Gloss, B52F00020 Satin (Clear) – *spray application.*

K. Code 106 - Interior Masonry (Admin Areas)
1. 1st Coat: SW Loxon Concrete & Masonry Primer-Sealer, LX2W50.
2. 2nd/3rd Coat: SW ProMar 200 Zero VOC Interior Latex Eg-Shel, B20 series.

L. Code 107 - Interior Masonry (Corridors and Student Areas)
1. 1st Coat: SW Loxon Concrete & Masonry Primer-Sealer, LX2W50.
2. 2nd/3rd Coat: SW ProMar 200 Zero VOC Interior Semi-Gloss, B31 series.

M. Code 107a - Interior Masonry (Sound Rated Partitions)
1. 1st/2nd Coat: SW Loxon Concrete & Masonry Primer, LX2W50.
2. 3rd/4th Coat: SW Pro Mar 200 Zero VOC Latex Semi-gloss, B31-2600 series.

N. Code 108 - Interior Metal, Natatoriums (Painted Surface, Enamel)
1. Surface Preparation: SSPC-SP 6/NACE 3.
2. 1st Coat: SW, Series, B65G10, Corothane I Galvapac 2K Zinc Primer, DFT 3.0-4.0 mils
3. 2nd Coat: SW, Series B58-600, Macropoxy 646 Fast Cure Epoxy, DFT 5.0-10.0 mils
4. 3rd Coat: SW, Sher-Loxane 800, Two Component Polysiloxane, DFT 4.0-6.0 mils.
5. Total DFT 12-20 mils.

O. Code 109 - Floors (Two Component Epoxy Coating)
   1. 1st Coat: SW ArmorSeal 33 Epoxy Primer/Sealer, B58 series.
   2. 2nd/3rd Coat: SW ArmorSeal 1000 HS, B67-2000 series
   3. At locker rooms and wet or damp areas provide anti-slip agent equal to one of the following:
      a. H&C Concrete Products, Sharkgrip Slip Resistant Additive
      b. QC Construction products, QC Sure Trac

P. Code 110a - Two Component Epoxy Coating for CMU Walls (All Foodservice Areas)
   1. 1st Coat: SW Pro Industrial Heavy Duty Block Filler, B42W150. This material is to be applied at the rate of 75sq. ft. per gallon or until surface is filled free from any voids or holes. Surface is to be filled free from excess mortar and cracks.
   2. 2nd/3rd Coat: SW Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.

Q. Code 110b - Two Component Epoxy Coating for Gyp Board Walls (All Foodservice Areas)
   1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W12600.
   2. 2nd/3rd Coat: SW Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.

R. Code 110c - Epoxy for CMU Walls at "Wet/Shower" Areas, Restrooms, Vehicle Wash Bays, Natatoriums, Janitor, & Mechanical Rooms
   1. 1st Coat: SW Kem Cati-Coat HS Epoxy Filler/Sealer, B42W400.
   2. 2nd/3rd Coat: SW Pro Industrial Water Based Catalyzed Epoxy B73-300 Series.

S. Code 110d - Epoxy for Gyp Board Walls at "Wet/Shower" Areas, Restrooms, Vehicle Wash Bays, Natatoriums, Janitor, & Mechanical Rooms
   1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W12600.
   2. 2nd/3rd Coat: SW Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.

T. Code 112 - Exterior Concrete or Stucco
   1. 1st/2nd Coat: SW Loxon XP Waterproofing Masonry Coating-Flat, LX11-50 Series.

U. Code 114 - Green Screen Paint
   1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W12600.
   2. 2nd/3rd Coat: Water Based Acrylic Chroma Key Matte Green Video Paint.

V. Code 115a - Interior Drywall (Admin Area Walls and Ceilings/Bulkheads)
   1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W12600.
   2. 2nd/3rd Coat: SW Pro Mar 200 Zero VOC Latex Eg-Shel, B20 series.

W. Code 115b - Interior Plaster (Standard Ceilings/Bulkheads)
   1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W12600.
   2. 2nd/3rd Coat: SW Pro Mar 200 Zero VOC Latex Eg-Shel, B20 series.

X. Code 116a - Interior Drywall (Walls in Corridors and Student Areas)
   1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W12600.
   2. 2nd/3rd Coat: SW Pro Mar 200 Zero VOC Latex Eg-Shel, B20series.

Y. Code 116b - Interior Plaster (High Humidity Ceilings)
   1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W12600.
   2. 2nd/3rd Coat: SW Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46-1150/2150 series.

Z. Code 117 - Exterior Masonry Surfaces
   1. 1st Coat: SW Loxon Concrete & Masonry Primer-Sealer, LX2W50.
   2. 2nd/3rd Coat: SW ConFlex XL Smooth High Build Acrylic Coating, CF11W51Series.

AA. Code 118 - Interior Non-Textured Drywall (where painted or applied graphics occur)
   1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
   2. 2nd/3rd Coat: SW Cashmere Interior Acrylic Latex DP-D17W00151.

BB. Code 120 - Exposed Structural Steel, Joist and Deck in Crawl Space
    1. Surface Preparation: SSPC SP-6 Commercial Metal Blast, 2-3 mil profile.
    2. 1st Coat: SW, Zinc Clad 4100 applied at 3-5 mils dry film thickness.

CC. Code 121 - Ceilings (Exposed Structural Steel and Deck)
    1. Touch-up factory prime coat on ferrous steel with SW Pro Induatrial ProCryl Universal Primer, B66-1300 series.
    2. 1st /2nd Coat: SW Pro Industrial Waterborne Acrylic DryFall Flat, B42W181.

DD. Code 122 - Interior Tectum Panels (Maintaining Acoustic Properties)
    1. 1st Coat: Pro Coat ProCoustic Acoustical Tile and Ceiling Coating.
    2. 2nd Coat (as needed): Same as first coat.

EE. Code 123 - Concrete Floor Sealer:
    1. Properly clean surface as per manufacturer's recommendations.
    2. 1st/2nd Coat: BASF MasterKure CC 250 SB (Formerly Kure-N-Seal)
    3. At locker rooms and wet or damp areas provide anti-slip agent equal to one of the following:
        a. H&C Concrete Products, Sharkgrip Slip Resistant Additive
        b. QC Construction products, QC Sure Trac

END OF SECTION

SECTION 10 1100
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Map Rails and Flag Holders

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing.

B. Section 06 1000 - Rough Carpentry: Blocking and supports.

1.03 SUBMITTALS

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

B. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.

D. Samples: Submit two samples 2 by 2 inch in size illustrating materials and finish, color and texture of tackboard surfacing and trim.

E. Manufacturer's printed installation instructions.

F. Maintenance Data: Include data on regular cleaning, stain removal .

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Visual Display Boards:
   1. American Visual Display Products: www.americanvisualdisplay.com.
   2. Claridge Products and Equipment, Inc: www.claridgeproducts.com.
   3. MooreCo, Inc: www.moorecoinc.com.
   4. Polyvision Corporation : www.polyvision.com.
   5. Nelson Adams NACO: www.nelsonadamsnaco.com
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 VISUAL DISPLAY BOARDS

A. Map Rail/Tack Strip: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall , full width of frame.
   1. Color: As selected from manufacturer's full range.

B. (2) Flag Holders: Cast aluminum bored to receive 1 inch diameter flag staff, bracketed to fit top rail of board.

C. Adhesives: Type used by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as instructed by the manufacturer.

3.02 INSTALLATION

A. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use, this includes wall anchors at 2’-0” o.c. and wall adhesive at maximum of 16” o.c.e.w.

B. Secure units level and plumb.

C. Butt Joints: Install with tight hairline joints.

3.03 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Building, Wayfinding and Title Signs.

C. Plaque.

D. Double-Sided Electronic Message Sign.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. 2012 TAS - Texas Accessibility Standards; 2012.

C. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

D. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Shop Drawings:
   1. Submit shop drawings showing each typical room and door sign type for fabrication, including typical drawings and details for each type to be provided.
   2. Submit shop drawings showing all graphic, wayfinding or other "special" signage for fabrication, including drawings and details for each to be provided.
   3. Shop drawings shall include plan location, directional information, size, font, color, mounting details, and scaled representation of configuration for each sign (included, but not limited to, building signs, directional/ wayfinding signs, and plaques) and graphic elements.

D. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. Request content of signs from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

E. Building signage, including, but not limited to, directional/ wayfinding signs, plaques, graphic elements and marquee signs:
   1. ALL signage shall be submitted for approval by the Owner for content, color, size and other physical qualities.
   2. ALL signage shall not be fabricated or installed without the written approval of the Owner.

F. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

G. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

H. Verification Samples: Submit samples showing colors specified.

I. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 - Product Requirements.

B. Package signs as required to prevent damage before installation.

C. Package room and door signs in sequential order of installation, labeled by floor or building.

D. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Room and Door Signs:
1. Apco Architectural Signs: www.apco.com
2. ASI Signage: www.asisignage.com.
3. Benchmark Signs: www.benchmarksigns.biz.
4. Best Sign Systems, Inc.: www.bestsigns.com.
5. Bayuk Graphic Systems, Inc.: www.bayukgraphics.com.
6. Cosco Industries: www.coscoarchitecturalsigns.com.
7. FASTSIGNS: www.fastsigns.com.
8. Inpro: www.inprocorp.com.
9. Kroy Sign Systems: www.kroysignsystems.com.
10. Mohawk Sign Systems, Inc.: www.mohawksign.com.
11. South Texas Graphic Specialties, Inc.: www.stxgraphics.com.
12. Substitutions: See Section 01 6000 - Product Requirements.

B. Building, Wayfinding and Title Signs:
1. Cosco Industries: www.coscoarchitecturalsigns.com.
2. FASTSIGNS: www.fastsigns.com.
3. Inpro: www.inprocorp.com.
4. A.R.K. Ramos Signage Systems: www.arkramos.com.
5. ASI Signage: www.asisignage.com.
6. Best Sign Systems, Inc.: www.bestsigns.com
7. Gemini Inc.: www.geminisignproducts.com
8. The Southwell Company: www.southwellco.com.
9. Substitutions: See Section 01 6000 - Product Requirements.

C. Double-Sided Electronic Message Sign.
1. Daktronics, Inc.: www.daktronics.com.
2. The Spectrum Corporation: www.spectrumscoreboards.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

D. Plaques:
   1. Cosco Industries: www.coscoarchitecturalsigns.com.
   2. Impact Signs: www.impactsigns.com
   3. The Southwell Company: www.southwellco.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards, 2012 TAS, ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with extruded acrylic panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. All letters, numbers and/or symbols shall contrast with their background. Characters and background shall have a non-glare finish.
   4. Background color as selected by architect from manufacturer’s actual color samples.
   5. Letterform shall be Futura upper case letters and numbers.
   6. Size of letters and numbers shall be as follows:
      a. Owners Room numbers shall be 1".
      b. Lettering for room ID signs shall be 3/4"or as noted.
      c. Provide construction floor plan room number in lower right hand corner on all signs. Number shall be 3/8” high and color shall match background.
      d. Symbol size shall be 6".
      e. Standard Grade 2 braille shall be ½" below copy.
      f. Corners: Square edges.
   7. Provide solid cover plate for back side of sign where mounted to glass.
   8. Entry/Exit Numbering: Provide 4" high door number on each side of all exterior doors for First Responder information. Numbers shall start at main primary entry and continue sequence in clockwise direction around the building.
   9. Exterior Room Identification Signage
      a. Provide cast aluminum sign with raised letters and border.
      b. Raised letters and border shall be satin finish with painted background.
      c. Signs shall have room function followed by Grade 2 Braille directly below.
      d. Provide at all exterior mechanical, electrical, fire riser rooms or other exterior locations.

C. Code Required Signage: Fire Protection and Utility Equipment Identification Access and Emergency Signage. See "Schedules" article below.

D. Tornado Shelter Signage:
   1. Signs shall comply with requirements of the ICC 500 - 2020, Section 508 Signage and as detailed on the "G" Series drawing sheets per shelter design requirements.
   2. Signs shall match other directional and information signs in general aesthetics.
   3. Signs shall comply with visual character requirements of the ADA Standard.
   4. Sign Type A, Design Information.
      a. Provide (1) one sign per shelter.
      b. Locate where shown on the drawings within the tornado shelter.
   5. Sign Type B, Directional.
      a. Provide (10) ten directional signs for bidding purposes, unless otherwise indicated on drawings.
      b. Coordinate actual quantity and locations with the Owner and Architect.
   6. Sign Type C, Entry.

a. Provide signs at each intended entry into the tornado shelter.
b. Signs shall be mounted on the right side of door frames just above the room signs (where applicable), bottom of sign at 60” AFF.

7. Sign Type D, Perimeter.
a. Provide signs at each exit within the tornado shelter.
b. Signs shall be mounted on the right side of door frames, bottom of sign at 60” AFF.

E. Building, Wayfinding and Title Signs:
1. Building Letters.
a. Use individual cast aluminum alloy, smooth surface letters.
b. Letters shall be Arial for bidding purposes unless noted otherwise on the drawings.
c. Finish shall be baked enamel, primed and spray coated with two (2) coats of baked enamel.
d. Reference drawings for font heights and locations.
e. Font and finish are for bidding purposes only. Submit samples to Architect for approval before fabrication of any material
f. Provide (5) 8" high numbers for the building address. Verify location with Building Inspector. Color shall be contrasting to building. Provide one set per building.
2. Custom Graphic Signs:
a. Laser cut acrylic letters/graphics where shown on the drawings
1) 1/2" impact-modified acrylic sheet.
2) Letters shall be laser cut with slight radius on all inside corners to prevent cracking.
3. All exterior wall, roof, and structure mounted letters/signs to be engineered by the sign manufacturer for mounting requirements and structural connections in accordance with the applicable wind loading and building codes. Sign manufacturer shall coordinate with adjacent building trades for connection requirements prior to other building elements being installed.

F. Plaques:
1. Provide 1 stainless steel plaque per building.
a. Design shall be as detailed in this section.
b. Tablet to be 18" x 18”. ¼” thickness.
c. The plaque shall be etched stainless steel background, free of all pits and gas holes, with raised borders and characters. All characters shall be sharp.
d. Border and faces of raised characters are to be a polished finish and background is to be brushed finish.
e. The plaque shall contain the names of the Superintendent of Schools, School Board members, the Architect, the Contractor, the Year and Title of the Building. Names and all edits to be given by Owner. If the size is not large enough to accommodate all the information given above, the plaque size shall be increased accordingly to 18” x 24”.
2. Mount the plaque where directed by the Architect.

G. Double-Sided Electronic Message Sign:
1. Basis of Design: Daktronics, Galaxy GT6x Series 10 mm, two-sided electronic message sign with electronic control software. See drawings for configurations and dimensions.
2. Display Capabilities:
a. The display shall contain a full LED matrix.
b. The LED display shall be capable of producing 281 trillion colors for RGB at all dimming levels.
c. The display shall be able to display messages composed of any combination of alphanumeric text, punctuation symbols, graphic images, and pre-canned video files.
3. Communication:

a. Ethernet Cellular Modem.

4. Control Software:
   a. Display content and scheduling shall be via a cloud-based solution. Software to be web browser access and hosted on manufacturer's servers at no cost to the Owner.

2.03 ACCESSORIES

A. Tape Adhesive: Double sided tape and clear silicone adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.
   1. Examine work area with installer present.
   2. If existing conditions are not as required to properly complete the work of this section, notify Architect.
   3. Do not proceed with installation until deficiencies in existing conditions have been corrected.

B. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.02 INSTALLATION

A. Interior/Exterior Room and Door Signage
   1. Install in accordance with manufacturer's instructions.
   2. Install neatly, with horizontal edges level.
   3. Locate signs where indicated:
      a. Room and Door Signs: Contractor shall locate specific mounting heights in coordination with the current TAS and ADA regulations. Mount sign on wall or glass.
      b. If no location is indicated obtain Owner's instructions.
      c. Wall or Glass Mounted: Double sided vinyl tape and clear silicone adhesive. Provide solid cover plate for back side of sign for glass installations.
   4. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

B. Building Identification Signage
   1. General: locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
   2. Install signs level, plumb, and at the height indicated with sign surfaces free from distortion or other defects in appearance.
   3. Cleaning and Protection: After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the owner.

C. Electronic Message Sign
   1. Comply with provisions of Section 01 7000 - Execution and Closeout Requirements
   2. Install marquee sign in accordance with manufacturer's instructions.
   3. Set support post plumb to ¼ inch in 10 feet. Fill hole with 3000 psi concrete to 2 inches above grade and extend concrete a minimum of 2 inches below bottom of post. Slope surface of exposed concrete to slope away from post.

3.03 SCHEDULES

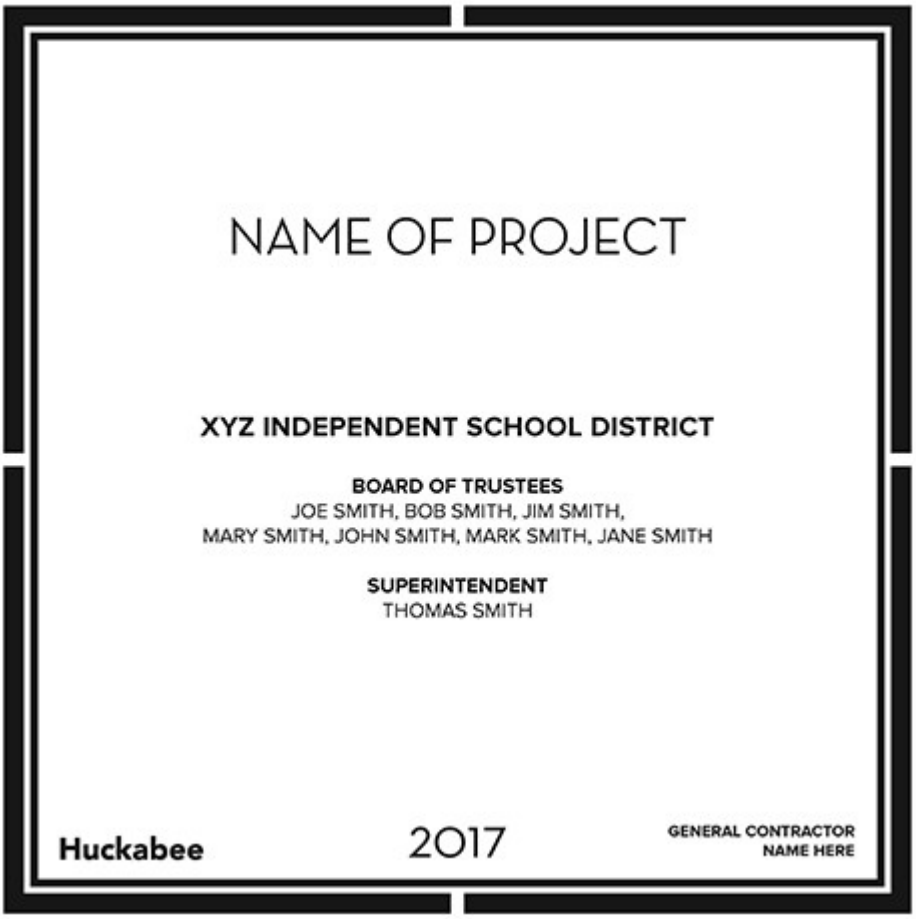
A. Interior/Exterior Room and Door Signage:
   1. Type A - ID signs with room number with one window slot. Window insert shall be fixed.
      a. Locations – Classrooms, offices.
   2. Type B - ID signs with room number and function.
      a. Locations – All locations except classrooms, offices.
      b. Provide "Roof Access" sign to rooms housing roof access hatch and ladder

c. Provide “Maximum Occupancy” signs at the following locations;
   1) Lecture Hall
   2) Cafeteria
   3) Auditorium
   4) Gymnasium
   5) Activity Room
d. Provide "Exterior Room Identification Signage" at all exterior mechanical, electrical and fire riser rooms.

3. Type C - Restroom signs with accessibility and gender symbol with the verbal description placed directly below and followed by Grade 2 braille.
4. Type D - Pictogram signs with accessibility and function symbol with the verbal description placed directly below and followed by Grade 2 braille.
   a. Messages: Text will be room names as directed by the Architect.
   b. Provide signage outside each assembly entrance stating ”Assistive Listening Devices Available” with the international symbol of access for hearing loss.
   c. Locations – Auditoriums, Distant Learning Rooms, Cafeterias, and Gymnasiums

B. Code Required Signage.
1. Fire Protection Equipment Identification, exterior access.
   a. Location(s): Permanently installed and readily visible. Verify mounting location with AHJ.
      1) Fire Suppression Sprinkler Riser and Valve Rooms.
   b. Copy: "RISER ROOM".
   c. Color: Copy to be White in contrast to its Red background.
2. Fire Protection and Utility Equipment Identification, interior access.
   a. Location(s): Verify mounting location with AHJ.
      1) Air-Conditioning Systems Control Rooms.
      2) Fire Suppression Sprinkler Riser and Valve Rooms.
      3) Fire Detection, Suppression or Control.
   b. Copy: For bidding purposes, use room name as indicated on drawings. Verify final copy with Architect prior to fabrication.
   c. Color: Copy to be in contrast to its background.
3. Elevator Lobby Emergency Signs: Provide one standardized design posted adjacent to each elevator call station on all floors. Copy: "IN CASE OF FIRE, ELEVATORS ARE OUT OF SERVICE. USE EXIT STAIRS".
4. Raised Character and Braille Exit Signs: A sign stating "EXIT" in visual characters, raised characters and braille and complying with ICC A117.1 shall be provided adjacent to each door to an area of refuge, providing direct access to a stairway, an exterior area for assisted rescue, an exit stairway or ramp, an exit passageway and the exit discharge.

C. **Plaque Example:**



END OF SECTION

SECTION 10 2113.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal screens.

C. Solid plastic shower and dressing compartments.

1.02 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

B. Section 05 5000 - Metal Fabrications: Concealed steel support members.

C. Section 06 1000 - Rough Carpentry: Blocking and supports.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

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

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall, floor, and ceiling supports, door swings.

D. Color charts showing colors available from the proposed manufacturer in the specified products.

E. Samples: Submit two samples of partition panels, 6 by 6 inch in size illustrating panel finish, color, and sheen.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.06 WARRANTY

A. Provide fifteen year manufacturer warranty against plastic breakage, corrosion, and delamination.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Toilet and Shower Compartments:
   1. Accurate Partitions Corp.: www.accuratepartitions.com.
   2. Ampco Products, Inc: www.ampco.com.
   3. General Partitions Mfg. Corp.: www.generalpartitions.com
   4. Global Partitions Corp.: www.globalpartitions.com
   5. Scranton Products (Santana/Comtec/Capital): www.scrantonproducts.com.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor and ceiling anchored.
   1. Color: As scheduled in Section 01 6210 - Schedule of Materials and Colors.
   2. Texture: Orange Peel.

B. Doors:
   1. Thickness: 1 inch.
   2. Width: 28 inch.
   3. Width for Accessible Use: 36 inch, out-swinging. (minimum)
   4. Width for Ambulatory Use: 34 inch, out-swinging.
   5. Height: 55 inch.

C. Panels:
   1. Thickness: 1 inch.
   2. Height: 55 inch, mounted 14" above the finished floor.
   3. Depth: As indicated on drawings.

D. Pilasters:
   1. Thickness: 1 inch.
   2. Width: As required to fit space; minimum 3 inch.

E. Screens: Without doors; to match compartments; mounted to wall with continuous panel brackets with vertical support/bracing same as compartments.

F. Shower Cubicles shall be 1" thick with all edges rounded to a 1/4" radius. Standard vanity size is 24" wide by customer specified length not to exceed 120" for a single piece.

2.03 ACCESSORIES

A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor and ceiling fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
   2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.

B. Wall, Pilaster, and Shower Brackets: Stainless steel; continuous type.

C. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

D. Hinges: Stainless steel, manufacturer's standard finish.
   1. Continuous-type hinge, self closing.

E. Door Hardware: Stainless steel, manufacturer's standard finish.
   1. Door Latch: Slide type with exterior emergency access feature.
   2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
   3. Provide door pull for outswinging doors.

F. Coat Hook with Rubber Bumper: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 1/4 inch to 3/8 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 2123
CUBICLE CURTAINS AND TRACK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended overhead curtain track and guides.

B. Surface mounted overhead curtain track and guides.

C. Cubicle curtains.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Owner-installed curtains.

B. Section 05 5000 - Metal Fabrications: Track supports above ceiling.

C. Section 06 1000 - Rough Carpentry: Blocking and supports for track.

D. Section 09 5100 - Acoustical Ceilings: Suspended ceiling system to support track.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

1.04 SUBMITTALS

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

B. Product Data: Provide data for curtain fabric characteristics.

C. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.

D. Samples: Submit two fabric samples, 12 by 12 inch in size illustrating fabric color.

E. Samples: Submit 12 by 12 inch sample patch of curtain cloth with representative top, bottom, and edge hem stitch detail, heading with reinforcement and carrier attachment to curtain header.

F. Samples: Submit 12 inch sample length of curtain track including typical splice, wall and ceiling hanger, and escutcheon.

G. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention .

H. Maintenance Data: Include recommended cleaning methods and materials and stain removal methods.

I. 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 Curtains: Two of each type and size.
   3. Extra Carriers: Ten.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept curtain materials on site and inspect for damage.

B. Store curtain materials on site and deliver to Owner for installation when requested.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cubicle Track and Curtains:
   1. A. R. Nelson Co: www.arnelson.com.
   2. C/S General Cubicle: www.c-sgroup.com/cubicle-track-curtains.

3. Imperial Fastener Co., Inc: www.imperialfastener.com.
4. Inpro: www.inprocorp.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRACKS AND TRACK COMPONENTS

A. Tracks: Extruded aluminum sections; one piece per track run.
1. Profile: Channel.
2. Mounting: Surface.
3. Structural Performance: Capable of supporting vertical test load of 50 lbs without visible deflection of track or damage to supports, safely supporting moving loads, and sufficiently rigid to resist visible deflection and without permanent set.
4. Track End Stop, Tees, Y's, and Switches: to fit track section. Provide one removable end closer per track to permit entry and removal of carriers.
5. Track Bends: Minimum 12 inch radius; fabricated without deformation of track section or impeding movement of carriers.
6. Suspension Rods: Tubular aluminum sections, sized to support design loads and designed to receive attachment from track and ceiling support.
7. Escutcheons: Where suspension rod meets finished ceiling or structure, provide escutcheons to match rod finish.
8. Finish on Exposed Surfaces: Clear anodized.

B. Curtain Carriers: Nylon rollers, size and type compatible with track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal.

C. Wand: Plastic, attached to lead carrier, for pull-to-close action.

D. Installation Accessories: Types required for specified mounting method and substrate conditions.

2.03 CURTAINS

A. Cubicle Curtains:
1. Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
2. Inherently flame resistant or flameproofed; capable of passing NFPA 701 test.
3. Material: Close weave polyester; anti-bacterial, self deodorizing, sanitized, and preshrunk.

B. Curtain: Reference Section 01 6210 for selected fabric; color as selected.

C. Open Mesh Cloth: Open weave to permit air circulation; flameproof material, manufacturer's standard color.

D. Curtain Fabrication:
1. Width of curtain to be 10 percent wider than track length.
2. Include open mesh cloth at top 20 inches of curtain for room air circulation, attached to curtain as specified above.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and supports above ceiling are ready to receive work of this Section.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install curtain track to be secure, rigid, and true to ceiling line.

B. Secure track to ceiling system. Provide above ceiling reinforcement for entire length of curtain.

C. Install curtains on carriers ensuring smooth operation.

3.03 SCHEDULES

A. Provide at Nurses stations and where indicated on drawings.

END OF SECTION

SECTION 10 2239
FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Folding panel partitions.

B. Ceiling track and operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking and track support shimming.

1.03 REFERENCE STANDARDS

A. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2020).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
   1. Require attendance by representatives of installer.
   2. Notify Architect four calendar days in advance of scheduled meeting date.

1.05 SUBMITTALS

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

B. Product Data: Provide data on partition materials, operation, hardware and accessories, track switching components, and colors and finishes available.

C. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in Texas, showing loads at points of attachment to the building structure.

D. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, and stacking depth.

E. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

F. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.

G. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.

H. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention, and installation sequence.

I. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.

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.

C. Rack testing for 10 years. (Tension strength stress test)

D. The manufacturer shall have a quality system that is registered to the ISO 9001 standards.

E. Manufacturer shall provide Load Deflection report indicating panels will maintain an acoustic seal based on structural deflection criteria.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse. Warranty to include all parts and labor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
   1. Kwik-Wall Company: www.kwik-wall.com.
   2. Moderco, Inc: www.moderco.com.
   3. Modernfold, a DORMA Group Company: www.modernfold.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS

A. Operable Panel Partition: Paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals.
   1. Basis of Design: Encore #932 as manufactured by Modernfold.
   2. Final Closure: Horizontally expanding panel edge with removable crank.
   3. Panel Construction:
      a. Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 18-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
   4. Panel Skin: Roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction.
      a. Sound Transmission Class (STC): Minimum 50 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 126 sq ft.
   5. Hinges for Panels, Closure Panels, Pass Doors, and Pocket Doors:
      a. SOSS invisible laminated hinge with antifriction segments mounted between each heat treated link. Welded internal hinge bracket shall support the hinge and allow for adjustment of hinge plates. Concealed hinges or hinges mounted into panel edge or vertical astragal are not acceptable. Exposed hinge barrels are not acceptable.
   6. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints
   7. Panel Weights: 8 lbs./square foot
   8. Panel Finish:
      a. Markerboard: White enamel on steel, bonded to the face of the panel with horizontal trim without exposed fasteners.
      b. Markerboard shall be provided on both sides as indicated on the drawings.
   9. Sound Seals:
      a. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic astragals or astragals in only one panel edge are not acceptable.

b. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
c. Horizontal bottom floor seals shall be:
1) Modernfold IA2 Bottom seal. Automatic operable seals providing nominal 2-inch (51mm) operating clearance with an operating range of +0.50-inch (13mm) to -1.50-inch (38mm) which automatically drop as panels are positioned, without the need for tools or cranks.

10. Suspension System:
a. #17 Suspension System
1) Suspension Tracks: Minimum 11-gauge, 0.12-inch (3.04mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 0.38-inch (10mm) diameter threaded rods. Aluminum track is not acceptable.
(a) Exposed track soffit: Steel, integral to track, and pre-painted off-white.
2) Carriers: One all-steel trolley with steel tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.

11. Pass Door: Single door, 36 inch wide by 84 inch high opening; same design and construction as panel; fit door with perimeter acoustic gaskets, concealed closer, keyed lock, and tool operated floor seal. Pass door panel legs require bottom seals that provide minimum 90lbs downward force to maintain stability during door operation. Face mounted or exposed stabilizers not acceptable. Thresholds across pass door opening are not acceptable. Pass door leaf has perimeter trim to protect face finish and to provide visual identification as required by International Building Code. Pass door leaf must incorporate:
a. A self-adjusting 2” retractable bottom seal.
b. Self-Illuminating Exit Sign per local code
c. Panic Hardware where required per code - minimum 1 required.
d. Door lock with master key prep where indicated on plans.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.

C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

D. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.02 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.

B. Fit and align partition assembly level and plumb.

C. Lubricate moving components.

D. Install acoustic sealant to achieve required acoustic performance.

E. Coordinate electrical connections.

3.03 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

C. Adjust partition assembly to achieve lightproof seal.

3.04 CLEANING

A. Clean finish surfaces and partition accessories.

B. Condition markerboard surfaces in accordance with manufacturer's instructions.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Protective wall covering.

1.02 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2014.

1.03 SUBMITTALS

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

B. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two samples of protective wall covering, 6 by 6 inches square.

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. 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. Manufacturer Warranty: Provide 5-year manufacturer warranty. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Protective Wall Covering:
   1. Basis of Design: Construction Specialties, Inc; Acrovyn High-Impact Wall Covering: www.c-sgroup.com/#sle.
   2. Inpro: www.inprocorp.com/#sle.

3. MDC Interior Solutions: www.mdcwall.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

2.03 PRODUCT TYPES

A. Protective Wall Covering:
1. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free.
2. Thickness: 0.040 inch.
3. Color: As indicated on drawings.
4. Accessories: Provide manufacturer's standard color-matched trim and moldings.
5. Mounting: Adhesive.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Form end trim closure by capping and finishing smooth.

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. Verify that substrate surfaces for adhered items are clean and smooth.
1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

D. 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. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.
1. Full-Height Installation: Establish a plumb line located at edge of starting point of first sheet to ensure following sheets will be installed plumb.
2. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
3. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
4. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
5. At joints indicated to be caulked, allow for a minimum 1/16 inch wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
6. Use a roller to ensure maximum contact with adhesive.
7. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.03 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. Commercial shower and bath accessories.

C. Under-lavatory pipe supply covers.

D. Electric hand dryers.

E. Diaper changing stations.

F. Fold down changing tables, adjustable height.

G. Dressing benches, wall-mounted folding.

H. Utility room accessories.

I. Owner Furnished, Contractor Installed products, (OFCI).

1.02 RELATED REQUIREMENTS

A. Section 06 1000-Rough Carpentry: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.

B. Section 10 2113.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

A. 2012 TAS - Texas Accessibility Standards; 2012.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

G. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017.

H. ASTM C1036 - Standard Specification for Flat Glass; 2016.

I. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

J. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

L. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

M. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

B. Provide accessories for Integrated Room Mock-ups as required in Section 01 4000-Quality Requirements.

C. Review delivery dates for Owner-Furnished products.

1.05 SUBMITTALS

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

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Include electrical characteristics.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify accessories using designations indicated.

D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

E. Closeout Submittals:
   1. Submit under provisions of Section 01 7800 Closeout Submittals.
   2. Maintenance Data: For accessories to include in maintenance manuals.

1.06 WARRANTY

A. Manufacturer’s Special Warranty: Manufacturer agrees to repair or replace items that fail in materials or workmanship within specified warranty period.
   1. All accessories not specifically listed otherwise, (1) year from date of Substantial Completion.
   2. Mirrors: Failures include, but are not limited to, visible silver spoilage defects; warranty period (5) years from date of Substantial Completion.
   3. Electric Hand Dryers:
      a. Sensors - (1) year from date of Substantial Completion.
      b. Motor Brushes - (3) years from date of Substantial Completion.
      c. All Other Components - (10) years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 OWNER FURNISHED PRODUCTS

A. Owner will furnish products indicated. The work includes receiving, unloading, handling, storing, protecting, and installing Owner-Furnished products.

B. Owner-Furnished Products:
   1. Toilet Tissue (Roll) Dispenser (**T1**).
   2. Paper Towel (Roll) Dispenser (**T6**).
   3. Soap Dispenser (**T11**) or (**T12**).

2.02 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:

1. Basis of Design: Model numbers listed are per Bradley Corporation unless noted otherwise.
2. ASI - American Specialties, Inc: www.americanspecialties.com/#sle.
3. Bobrick Washroom Equipment, Inc.: www.bobrick.com.
4. Bradley Corporation: www.bradleycorp.com/#sle.
5. GAMCO – (General Accessory Mfg. Co): www.gamcousa.com.
6. Georgia-Pacific Professional: www.blue-connect.com/#sle.
7. Kimberly Clarke Professional: www.kcprofessional.com.
8. Substitutions: Section 01 6000 - Product Requirements.

B. Under-Lavatory Pipe Supply Covers:
1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
2. Substitutions: Section 01 6000 - Product Requirements.

C. Electric Hand/Hair Dryers:
1. Excel Dryer: www.exceldryer.com/#sle.
2. Substitutions: Section 01 6000 - Product Requirements.

D. Diaper Changing Stations:
1. Koala Kare Products: www.koalabear.com/#sle.
2. Saniflow, a Mediclinics Company: www.saniflowcorp.com.
3. Substitutions: 01 6000 - Product Requirements.

E. Fold Down Changing Tables:
1. MAX-Ability, Inc.: www.max-ability.com.
2. Substitutions: 01 6000 - Product Requirements.

F. Dressing Benches:
1. Access Able Designs, Inc.: www.accessabledesigns.com.
2. Substitutions: 01 6000 - Product Requirements.

G. Utility Room Accessories:
1. Bradley Corporation: www.bradleycorp.com.
2. Zurn Industries, LLC: www.zurn.com.
3. Substitutions: 01 6000 - Product Requirements.

H. Source Limitations: Provide products of each category type by single manufacturer.

2.03 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 four 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. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

G. Adhesive: Two component epoxy type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof.

I. Expansion Shields: Fiber or rubber as recommended by accessory manufacturer for component and substrate.

2.04 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.

C. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

D. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

E. Back paint components where contact is made with building finishes to prevent electrolysis.

2.05 COMMERCIAL TOILET ACCESSORIES

A. Mirrors: Stainless steel framed, (**T9**) and (**T10**): 1/4 inch thick tempered safety glass; ASTM C1048.
   1. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners; satin finish.
   2. Back of unit shall be galvanized steel, secure to frame with concealed screws, equipped with integral horizontal hanging brackets and separate wall hanger for concealed mounting.
   3. Products:
      a. Basis of Design: (**T9**), Model 7802-1836, single lavatory mirror, 18” x 36”.
      b. Basis of Design: (**T10**), Model 7802-2460, full-length mirror, 24” x 60”.

B. Grab Bars, (**T4**) and (**T5**): Stainless steel, textured surface.
   1. Heavy 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, exposed 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.
      e. Mounting: Flanges with concealed fasteners.
      f. Products:
         1) Basis of Design: (**T4**), Model 8122-00136, 36 inch grab bar.
         2) Basis of Design: (**T5)**, Model 8122-00142, 42 inch grab bar.

C. Combination Sanitary Napkin/Tampon Dispenser, (**T21**): Stainless steel, semi-recessed.
   1. Door: Seamless 0.05 inch door with returned edges and two tumbler locks.
   2. Cabinet: Fully welded, 0.03 inch thick sheet.
   3. Operation: 25 cent coin required to operate dispenser. Provide locked coin box, separately keyed.
   4. Minimum capacity: 30 napkins and 28 tampons.
   5. Products:
      a. Basis of Design: Model 4017-10-45.

D. Sanitary Napkin Disposal Unit, (**T2**): Stainless steel, with self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
   1. Mounting: Partition mounted, dual access or surface mounted; refer to drawings.
   2. Products:
      a. Basis of Design: Model 4721-15, partition mounted, serves two compartments.
      b. Basis of Design: Model 4722-15, surface mounted.

E. Single Robe Hook (**T13**): Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
   1. Products:
      a. Basis of Design: Model 9114.

2.06 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod, (**T17**): Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for concealed mounting.
   1. Length: Refer to drawings.
   2. Products:
      a. Basis of Design: Model 9538, shower curtain rod.

B. Shower Curtain, (**T17**):
   1. Material: 9-oz. Nylon reinforced vinyl, 0.014 inch thick with top edge hemmed, matte finish, with antibacterial treatment, flameproof and stain-resistant.
   2. Size: Minimum 2-inches wider than the opening by 78 inches high, hemmed edges.
   3. Grommets: Corrosion-resistant metal; pierced through top hem on 6 inch centers.
   4. Color: White.
   5. Shower Curtain Hooks: Stainless steel spring wire designed for snap closure.
   6. Products:
      a. Basis of Design: Model 9537, shower curtain.
      b. Basis of Design: Model 9536, shower curtain hooks.

C. Shower Grab Bars, (**T14**), (**T15**), (**T15A**) and (**T16**): Stainless steel, textured surface.
   1. Heavy 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, exposed 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.
      e. Mounting: Flanges with concealed fasteners.
      f. Products:
         1) Basis of Design: (**T14**), Model 8122-00124, 24 inch.
         2) Basis of Design: (**T15**), Model 8122-0591528, L-shaped 15"x28". Refer to drawings for handing.
         3) Basis of Design: (**T15A)**, Model 8122-0592436, L-shaped 24"x36". Refer to drawings for handing.
         4) Basis of Design: (**T16**), Model 8122-00148, 48 inch.

D. Folding Shower Seat, (**T18**): Wall-mounted surface; welded tubular seat frame, structural support members, hinges, and mechanical fasteners of Type 304 stainless steel, reversable seat. Refer to drawings for handing.
   1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of white color.
   2. Size: TAS/ADA Standards compliant.
   3. Products:
      a. Basis of Design: Model 9569.

E. Wall-Mounted Soap Dish, (**T22**): Heavy duty, seamless stainless steel, surface-mounted with drain holes, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
   1. Coordinate location with grab bar to avoid conflicts.
   2. Products:
      a. Basis of Design: Model 9014

F. Towel Bar, (**T19**): Stainless steel, six hooks and 60-inch backplate with exposed surfaces, satin finish.
   1. Mounting: Surface mounted.
   2. Products:

a. Basis of Design: Model 9946.

G. Single Robe Hook (**T13**): Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
1. Products:
a. Basis of Design: Model 9114.

2.07 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers (**T23**):
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with TAS/ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
b. Comply with ASTM C1822, type indicated.
c. Microbial and Fungal Resistance: Comply with ASTM G21.
4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
6. Products:
a. Basis of Design: Plumberex Specialty Products, Inc; Plumberex Handy-Shield Maxx: www.plumberex.com/#sle.

2.08 ELECTRIC HAND DRYERS

A. Electric Hand Dryers, (**T7**): Traditional fan-in-case type, with downward fixed nozzle.
1. Operation: Automatic, sensor-operated on and off.
2. Mounting: Recess.
3. Cover: Stainless steel with brushed finish.
a. Tamper-resistant screw attachment of cover to mounting plate.
4. Heater: 900 W, minimum, at full power.
5. Fan/Heater Control: Field adjustable down to approximately half-speed with corresponding reduction in heat output.
6. Supply Voltage: 120 V, single phase, 60 Hz, nominal.
7. Electric Hand Dryer Products:
a. Basis of Design: Excel Dryer Inc; XLERATOR: www.exceldryer.com/#sle.

2.09 DIAPER CHANGING STATIONS

A. Diaper Changing Station, (**T20**): Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
1. Compliant with the 2012 TAS, Texas Accessibility Standards for work surface height and protruding object limitations, both open and closed positions.
2. Material: Stainless steel.
3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
4. Color: Satin finish.
5. Minimum Rated Load: 220 pounds.
6. Products:
a. Basis of Design: Saniflow, a Mediclinics Company; Babymedi Model CP0016HCS-ASTM.

2.10 FOLD DOWN CHANGING TABLES

A. Adjustable Height Wall Mounted Fold Down Changing Station, (**T28**):
1. Length: 75.25"
2. Width: 31"

3. Height: Adjustable from 12" to 38 7/8"
4. Electrical:
   a. Operate at 24v / 1amp via 120v wall outlet
   b. Integrated transformer and US 8’ power cord
   c. Linak liquid tight actuator and control system
   d. Chain drive; maintenance free motor
5. Weight Capacity: 440 lbs.
6. Color: Graphite Gray.
7. Warranty: Three year limited warranty on parts; one year on labor.
8. Product:
   a. Basis of Design: MAX-Ability, Inc., Pressalit Care 3000, model R8592318301, electrically height adjustable adult changing table, www.max-ability.com.

2.11 DRESSING BENCHES

A. Dressing Bench, Wall-Mounted Folding, (**T25**):
   1. Description: Stainless steel tubular frame, 42”W x 20”D seat and 500-lb. capacity.
      a. Seat: ½-inch slatted phenolic seat; color as selected by Architect.
   2. Mounting: Surface, anchored to wall.
   3. Basis of Design: Access Able Designs, Inc.; Model D-101-42: www.accessabledesigns.com.

2.12 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder, (**T24)**: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
   1. Holders: Three spring-loaded rubber cam holders.
   2. Length: Manufacturer's standard length for number of holders.
   3. Mounting: Surface.
   4. Products:
      a. Basis of Design: Model 9953 as manufactured by Bradley Corporation.

B. Mop Basin Hose and Bracket, (**T24A**): Heavy-duty 5/8-inch, cloth-reinforced flexible rubber hose with 3/4-inch brass coupling. Stainless steel, Type 304, bracket with rubber grip.
   1. Length: 30 inches.
   2. Mounting: Surface.
   3. Products:
      a. Basis of Design: Zurn Light Commercial Plumbing Products; Zurn Z1996-HH: www.zurn.com.

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.

E. See Section 06 1000-Rough Carpentry for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

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.

D. Locate accessories in order that they do not interfere with door swings or use of fixtures. Install recessed accessories after wall finishes have been completed.

E. Anchor accessories with bolts, plates, and approved type fasteners. Take down any loose items and repair damaged wall surfaces. Accessories anchored to toilet partitions shall be thru-bolted.

F. Mount surface mounted accessories to backup material with toggle bolts, plumb and align.

G. At metal stud partitions, provide fire-retardant treated wood blocking for anchorage of grab bars, wall-mounted seats and benches, baby changing stations, and other such wall-mounted accessories where additional loads are anticipated.
   1. For accessories protruding 3-inches or less from the wall, Contractor may utilitize ClarkDietrich Danback Flexible Wood Backing System with FlamePRO fire-retardant treated wood.

H. At recessed electric hand dryers located in metal stud wall partitions, install rigid sound insulation in wall around unit.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

3.05 SCHEDULE

A. Provide the following accessories at type of room scheduled, whether indicated on the drawings or not. Refer to drawings for configuration and mounting heights. Provide (1) of each per accessory listed unless otherwise noted or designated as Owner-furnished.

B. Type C – Toilet Compartments
   1. Type C1 Standard Compartment:
      a. T1 Toilet Tissue (Roll) Dispenser.
      b. T2 Sanitary Napkin Disposal (at designated female restrooms, grades 6 to adult only).
   2. Type C2, C3 and C5 Accessible Compartments:
      a. T1 Toilet Tissue (Roll) Dispenser
      b. T2 Sanitary Napkin Disposal (at designated female restrooms, grades 6 to adult only).
      c. T4 Grab Bars, 36 inch.
      d. T5 Grab Bars, 42 inch.
   3. Type C4 Ambulatory Accessible Compartment:
      a. T1 Toilet Tissue (Roll) Dispenser.
      b. T2 Sanitary Napkin Disposal (at designated female restrooms, grades 6 to adult only).
      c. T5 Grab Bars, 42 inch; (2) each.

C. Type L - Lavatories:
   1. T9 Mirror.
   2. T11 Soap Dispenser. At locations with multiple lavatories, provide at a ratio of (1) dispenser per (2) lavatories.
   3. T23 Undersink Piping Covers per lavatory.

D. Type MS - Mop Sink Locations:

1. T24 Mop and Broom Holder.
2. T24A Mop Basin Hose and Bracket.

E. Type S – Showers:
   1. Type S3 Standard Roll-In Type Shower Compartment w/Seat:
      a. T13 Coat/Clothes Hook. Locate adjacent to shower seat wall.
      b. T15A Shower Grab Bar.
      c. T17 Shower Curtain & Rod w/Curtain Hooks.
      d. T18 Folding Shower Seat.
      e. T22 Wall-Mounted Soap Dish.

F. Type T – Toilet Rooms:
   1. Type T1 Single-User Toilet Room:
      a. T1 Toilet Tissue (Roll) Dispenser.
      b. T2 Sanitary Napkin Disposal (at unisex or designated female restrooms, grades 6 to adult only).
      c. T4 Grab Bars, 36 inch.
      d. T5 Grab Bars, 42 inch.
      e. T6 Paper Towel (Roll) Dispenser.
      f. T9 Mirror.
      g. T11 Soap Dispenser.
      h. T13 Coat/Clothes Hook.
      i. T23 Undersink Piping Covers.
   2. Type T2 Single-User or Family Toilet Room:
      a. T1 Toilet Tissue (Roll) Dispenser.
      b. T2 Sanitary Napkin Disposal (at unisex or designated female restrooms, grades 6 to adult only).
      c. T4 Grab Bars, 36 inch.
      d. T5 Grab Bars, 42 inch.
      e. T6 Paper Towel (Roll) Dispenser.
      f. T9 Mirror.
      g. T11 Soap Dispenser.
      h. T20 Baby Changing Station.
      i. T13 Coat/Clothes Hook.
      j. T23 Undersink Piping Covers.

G. Type WF - Wash Fountains
   1. T9 Mirror, one per station.
   2. T11 Soap Dispenser, (2) each.
   3. T23 Undersink Piping Covers, if wash fountain is not provided with skirt.

H. Break Rooms, Work Rooms, Clinics, Classrooms:
   1. T6 Paper Towel (Roll) Dispenser.
      a. At each sink location
   2. T11 Soap Dispenser.
      a. At each sink location

END OF SECTION

SECTION 10 4313
DEFIBRILLATOR CABINETS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Defibrillator Cabinets

1.02 SUBMITTALS

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

B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.03 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. The contractor shall furnish a written guarantee warranting all materials, devices, equipment and workmanship to be free of defects for a period of one (1) year from the date of completion and acceptance. Any defects in materials, devices, equipment and workmanship which become apparent within the guarantee period shall be repaired and replaced by the contractor at his own expense and at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. JL Industries/Activar: www.activarcpg.com

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DEFIBRILLATOR CABINETS:

A. Basis of Design: 1400 Lifestart Series AED Cabinets
   1. Cabinet with Steel Trim and Door: 1400 Lifestart Series, model 1417
      a. Cabinet Style: Semi-recessed.
      b. Components:
         1) Tub: Cold-rolled steel.
            (a) Finish: Factory-applied white powder coat paint finish.
         2) Door and Trim Construction: Cold-rolled steel; flush doors with 5/8 inch (15.88 mm) door stop attached by continuous hinge and equipped with zinc-plated with roller catch.
            (a) Finish: Factory-applied white powder coat paint finish.
            (b) Style F17: Full Tempered Glazing; Pull & AED Decal
         3) Trim Style and Depth:
            (a) Semi-Recessed Cabinet:
            (b) Square Edge: 1-1/2 inch (38.10 mm).
      c. Fire-Rating: Nonfire-rated or Fire-Rated, reference plan for requirements.
      d. Alarms: Standard: 85 db Commander (audible) cabinet-mounted alarm standard (battery operated) to protect against theft or tampering. Alarm deactivated when door is closed.
      e. Wall Signs and Cabinet Lettering:
         1) AED wall signs: 14S

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install in accordance with approved submittals and manufacturer's instructions.

B. This contractor shall do all fitting, fastening, connecting, leveling and placing of all Equipment as required to complete each item in its permanent position.

3.02 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstrate proper operation of equipment to Owner's designated representative.

3.03 ADJUSTING

A. Prepare equipment and systems in accordance with manufacturers' instructions and recommendations.

B. Field Test after completing installation to verify performance.

C. Adjust for proper operation within manufacturer's published tolerances.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

D. Fireman's Knox Items: Box, Padlock, and FDC Plug.

1.02 RELATED REQUIREMENTS

A. Section 01 4100 - Regulatory Requirements

B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 DEFINITIONS

A. Where indicated on the Drawings, the abbreviation "F.E.C." defines a fire extinguisher and cabinet and the abbreviation "F.E." is for a fire extinguisher without a cabinet.

1.04 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.

C. UL (DIR) - Online Certifications Directory; Current Edition.

D. International Fire Code.

1.05 SUBMITTALS

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

B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.

C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, locations of individual fire extinquishers, mounting measurements for wall bracket, installation procedures, and accessories required for complete installation.

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.

G. Material and Safety Data Sheets for all mastics, glues, and adhesives and for insulating material for fire doors.

1.06 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain products in this Section from one manufacturer.

B. Certifications

1. Provide extinguishers which are U.L. listed and bear the U.L. "Listing Work" for type, rating, and classification.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 - Product Requirements.

B. Store extinguishers in protected location until after final cleaning is completed.

1.08 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

1.09 WARRANTY

A. Comply with requirements of Section 01 7800 - Closeout Submittals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers and Cabinets and Accessories:
   1. JL Industries, Inc: www.jlindustries.com.
   2. Larsen's Manufacturing Co: www.larsensmfg.com.
   3. Samson Products, Inc.: www.samsonproducts.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Fireman's Knox Box:
   1. Knox Company; www.knoxbox.com.
   2. 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.
   2. UL Rating: 2A-10B:C, minimum.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Product: MP10 for all typical installations.
   2. Product: MP5 at Elevator Equipment Rooms and Science Labs.
   3. Class: A:B:C type.
   4. Size: 5 and 10 pound.

C. Halotron I Type Fire Extinguishers: Stainless steel tank, with pressure gage.
   1. Product: HT5 at Computer Lab.
   2. Class: A:B:C type.
   3. Size: 5 pound.

D. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
   1. Product: WC-6L (6 liter capacity) at Kitchen (20 ft. away from hood).
   2. Class: K.
   3. Size: 1.6 gallons.

2.03 FIRE EXTINGUISHER CABINETS

A. Product - reference schedule below:

Wall Construction	Model	Fire Rated	Projection	Box Depth	Wall Depth
3-5/8" Metal Stud or 6" CMU	AL-2409-6R	No	2-1/2"	6"	4"
3-5/8" Metal Stud or 6" CMU	AL-FS-2409-R4	Yes	3-1/2"	6"	4"
8" CMU or wider	AL-2409-6R	No	2-1/2"	6"	4"
8" CMU or wider	AL-FS-2409-6R	Yes	2-1/2"	6"	4-7/8"
8" CMU	AL-2712-RA	No	4"	8"	4-1/2"

8" CMU	AL-FS-2712-RA	Yes	4"	8"	5-3/8"

B. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

C. Cabinet Configuration: Semi-recessed type.
   1. Projected Trim: Returned to wall surface, with 2-1/2 inch projection, and 1 inch wide face.

D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with roller type catch. Hinge doors for 180 degree opening with continuous piano hinge. Provide solid doors at athletic and shop areas.

E. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

G. Weld, fill, and grind components smooth.

H. Finish of Cabinet Exterior Trim and Door: Clear satin anodized aluminum.

I. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. If extinguisher is not located in a cabinet, provide bracket no. 860.

C. Graphic Identification: Applied decal use vertical decal spelling.

2.05 FIREMAN'S KNOX BOX

A. Provide and install emergency access lock box where shown on the drawings.
   1. Mount: Recessed (7"x7"x3.25"), provide recessed mounting kit with face flange. Mount at 6'-0" above ground level, verify with fire marshal.
   2. Lock: U.L. Listed. Double action rotating tumblers and hardened steel pins accessed by a biased cut key.
   3. Finish: Pre-treatment – Zinc Phosphate; Final Coating – weather resistant polyester powdercoat.
      a. Color: Black.
   4. Alarm: Alarm tamper switch. Connect to buildings security system.
   5. Model: "Knoxbox Series 3200".

B. Provide and install two-position electric override key switch with mounting plate. Provide lock cover with weather resistant operation and an emergency agency ID label. Controls emergency power system shutoff. Refer to electrical drawings for locations.
   1. Mount: Recessed, provide recessed mounting kit with face flange. Mount as directed by fire marshal.
   2. Alarm: Alarm tamper switch. Connect to buildings security system.
   3. Model: "Knoxbox 3502 with key switch".

2.06 FIREMAN'S KNOX PADLOCK

A. Provide padlock at access gates where indicated on plan.
   1. 3/8" diameter stainless steel shackle.
   2. Heavy-duty brass body with EPDM boot.
   3. Model: Knox 3753.

2.07 FIREMAN'S KNOX FDC PLUG

A. Provide FDC plugs at all locations.
   1. Plug shall be locking style with Knox key wrench.
   2. Bright stainless cover.
   3. Verify plug size and threads with Fire Department.

4. Model: Knox Model 3011.

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 cabinets plumb and level in wall openings at locations shown on the Drawings. Install compliant with applicable accessibility requirements.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 10 5100
LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lockers.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete base construction.

B. Section 06 1000 - Rough Carpentry: Wood blocking and nailers.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan.

D. Samples: Submit two samples 12 by 12 inches in size, of each color scheduled.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

G. See Section 01 6000 - Product Requirements, for additional provisions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 - Product Requirements.

B. Protect locker finish and adjacent surfaces from damage.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide one year manufacturer warranty for repair or replacment of lockers that fail in material or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lockers:
   1. ASI Storage Solutions, Inc.: www.asilockers.com.
   2. Debourgh Manufacturing Co.: www.debourgh.com.
   3. General Storage Systems: www.generalstoragesystems.com
   4. List Industries: www.listindustries.com.
   5. Lyon Workspace Products: www.lyonworkspace.com.
   6. Penco Products, Inc: www.pencoproducts.com.
   7. Republic Storage Systems Co: www.republicstorage.com.
   8. WEC Manufacturing: www.itswec.com
   9. Win-Holt Equipment: www.winholt.com.
   10. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LOCKER APPLICATIONS

A. Size, type and quantity: Reference Drawings.
   1. Basis of Design:
      a. Typical Lockers: Republic Storage Systems, Single Point II Corridor.

2.03 METAL LOCKERS

A. All Lockers: Factory assembled, made of formed sheet steel, Cold-rolled mild steel, uncoated, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
   1. Where ends or sides are exposed, provide flush panel closures.
   2. Provide filler strips where indicated, securely attached to lockers.
   3. Colors: Refer to Section 01 6210 - Schedule of Materials and Colors.

B. Assembly:
   1. Typical Lockers: (KD) Rivet with backup washer to provide permanent shake-proof fastening.

C. Typical Locker Body: Formed and flanged; with steel stiffener ribs.
   1. Body, Shelves, Tops and Trim: 24 gage, 0.0239 inch.
   2. Base: Reference drawings for base height and details

D. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
   1. Door Frame: 16 gage, 0.0598 inch, minimum.
   2. Provide ventilation slots in top and bottom of door frame.

E. Doors: Hollow channel edge construction, 1 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
   1. Door Outer Face: 14 gage, 0.0747 inch, minimum.
   2. Form recess for operating handle and locking device.
   3. Ventilation Method for Typical Lockers: Provide ventilation slots in top and bottom of door.

F. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; 2" high, 5-knuckle, full loop, tight pin style, weld securely to locker body and double riveted to the inside of the door.
   1. Hinge Thickness: 14 gage, 0.0747 inch.

G. Coat Hooks: Stainless steel or zinc-plated steel.
   1. Two single prong wall hooks and one double prong back hook for all single, double, and triple tier lockers. For lockers over 42" high, provide one hat shelf. Lockers under 20" high are not equipped with hooks.

H. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 1/2 inch high of block font style, in contrasting color.

I. Latching: Latching shall be achieved by securing a frame hook to the locker side frame located midway up on the door.
   1. Locking device shall be built-in lock. The padlock hasp shall be eliminated and the recessed pocket shall contain only the necessary punching to mount the lock. The frame hook shall have an interlocking finger oriented 90 degrees to the door edge to serve as a catch when padlocks are used and to resist prying when built-in locks are used. Equip each locker with a Master Lock model #1690 built-in lock. Locking device shall be pre-locking so mechanism can be locked in open position, door locking automatically when closed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.
C. Place and secure on prepared base.
D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.
E. Bolt adjoining locker units together to provide rigid installation.
F. Install end panels, filler panels, and sloped tops.
G. Install accessories.
H. Conceal fasteners on all face frames.
I. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 7300
PROTECTIVE COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-engineered, free-standing, pre-finished extruded aluminum walkway covers.

B. Pre-engineered, pre-finished extruded aluminum wall mounted hanging canopies.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

B. AAMA 612 - Voluntary Specification, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2002.

C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performance Organic Coatings on Aluminum Extrusions and Panels - American Architectural Manufacturers Association; 2011

D. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 6000 Tensile Strength; 2010.

E. ASTM A792/A792M - Steel Sheet, 55% Aluminum-Zinc Alloy Coated by Hot Dip Process; 2010.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

H. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs; 2002 (Reapproved 2008).

1.04 SUBMITTALS

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

B. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing all profiles, sections of all components, finishes, fastening details, and manufacturer's technical and descriptive data. Include field dimensions of openings and elevations on shop drawings.

C. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by profession engineer.

D. Samples: 12 inches by 12 inches minimum illustrating design, workmanship and finish color.

E. Designer Qualification Statement.

F. Specimen Warranty: Furnish a copy of manufacturer's standard warranty.

G. Installer Qualification Statement.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work licensed in Texas.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with no less than five years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section, and;
   1. With minimum five years of documented experience.
   2. Approved by manufacturer.

D. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway or canopy system (sidewalks, curbs, building fascias, etc.).

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site ready for erection.

B. Package using methods that prevent damage during shipping and storage on site.

C. Store materials under cover and elevated above grade.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a one-year period after date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Protective Covers:
   1. AVAdek: www.avadek.com.
   2. Architectural Fabrication, Inc.: www.arch-fab.com
   3. Aluminum Techniques Inc.: www.aluminumtechniques.com
   4. Canopy Solutions, LLC: www.canopy-solutions.com
   5. DITT-Deck, Dittmer: www.dittdeck.com
   6. Peachtree Protective Covers: peachtreecovers.com
   7. East Texas Canopy, Inc: www.easttexascanopy.com
   8. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WALKWAY COVERS

A. Extruded Aluminum Walkway Cover shall consist entirely of extruded aluminum sections(roll-formed not acceptable). System shall consist of heli-arc welded, one-piece rigid structural bents (column and beam assemblies), decking, fascia, accessory items and hardware to provide a complete system.
   1. Configurations: As indicated on drawings.
   2. Sizes: As indicated on drawings.
   3. Design Criteria: Design and fabricate to resist loads without failure, damage, or permanent deflection as dictated by the applicable building code. Structure shall be capable of sustaining and supporting a concentrated load such as being walked upon.
   4. Finish: Fluoropolymer, AAMA 2605, minimum 70 percent polyvinylidene fluoride, 2 coats, minimum 1.2 mils dry film thickness.
      a. Pretreated with chrome phosphate conversion coating after cleaning.
      b. Application by coating manufacturer's approved applicator.
   5. Finish Color: Refer to Section 01 6210 - Schedule of Colors for approved color selection.
   6. Provide a complete system ready for erection at project site.
   7. Shop-fabricate to the greatest extent possible; disassemble if necessary for shipping.

8. The Contractor's Walkway Cover Engineer shall not bear on the existing building unless the Walkway Cover Engineer or another Structural Engineer hired by the Contractor evaluates the capacity of the existing structure to withstand loads that would be imposed by the walkway cover and either verifies that there is sufficient capacity or modifies the existing structure in a way that is approved by the Architect. If the covering is connected to the existing building, the Walkway Cover Engineer shall design the connection. For proposal purposes, the Contractor shall assume that it is not acceptable to bear on or attach to the existing building other than with flashing. The Contractor shall be permitted to submit alternative layouts of columns for consideration by the Architect if the alternative layout does not increase the cost of construction or the schedule.

B. Concrete Foundations
   1. The foundation shall be designed by the Contractor's Walkway Cover Engineer. All foundations designed by the Walkway Cover Engineer shall be required to comply with the recommendations of the Geotechnical Engineer in the soil reports provided as part of this project manual.
   2. The Contractor shall have foundations designed and installed to accommodate existing conditions such as nearby existing foundations (which shall not be undermined) and overhead obstructions (which may require low-overhead pier drilling equipment).
   3. Refer to Section 03 3000 - Cast-In-Place Concrete.
   4. Sleeves (styrofoam blockout) shall be furnished by the walkway cover manufacturer and placed by the general contractor.

2.03 CANOPY SYSTEMS

A. The Contractor's Canopy Engineer or another Structural Engineer hired by the Contractor shall evaluate the capacity of the existing structure to withstand loads that would be imposed by the canopy and either verify that there is sufficient capacity or modify the existing structure in a way that is approved by the Architect. The Canopy Engineer shall design the connection. The Contractor shall be permitted to submit alternative configurations for consideration by the Architect if the alternative configurations do not increase the cost of construction or the schedule.
   1. Exception: Where specifically noted on the drawings that the existing structure has been evaluated by the Architect or a Subconsultant of the Architect and it has been determined that the structure is acceptable to withstand the loads imposed by the canopy or details are provided for the modification of the existing structure, then the Contractor's Canopy Engineer does not need to evaluate the existing structure but does need to submit to the Architect the unfactored loads imposed for review before fabrication.

B. Canopy: Shop fabricated, shop finished, extruded aluminum decking, (roll-formed not acceptable), outriggers, fascia and hanging rod assemblies free of defects impairing strength, durability or appearance.
   1. Configurations: As indicated on drawings.
   2. Sizes: As indicated on drawings.
   3. Design Criteria: Design and fabricate to resist loads without failure, damage, or permanent deflection as dictated by the applicable building code.
   4. Finish: Fluoropolymer, AAMA 2605, minimum 70 percent polyvinylidene fluoride, 2 coats, minimum 1.2 mils dry film thickness.
      a. Pretreated with chrome phosphate conversion coating after cleaning.
      b. Application by coating manufacturer's approved applicator.
   5. Finish: Woodgrain, AAMA 2604 – Super Polyester Powder Coated
   6. Finish Colors: Refer to Section 01 6210 - Schedule of Colors for approved color selection.
   7. Provide a complete system ready for erection at project site.
   8. Shop-fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.04 MATERIALS

A. Aluminum Extrusions: ASTM B209 or B 221.

B. Aluminum Coated Steel Sheet: ASTM A792/A792M.

C. Concealed Structural Supports: Aluminum, or steel coated for corrosion resistance and dissimilar metal isolation.

D. Fasteners: ASTM F593 stainless steel or ASTM A 307 carbon steel.
   1. Deck Screws (rivets not permitted): Type 18-8 non-magnetic stainless steel sealed with a neoprene "O" ring beneath 5/8" outside dimension, conical washer.
   2. Fascia Rivets: Size 3/16" by 1/2" grip range aluminum rivets with aluminum mandrel.
   3. Bolts: All bolts, nuts and washers to be 18-8 non-magnetic stainless steel.
   4. Tek Screws: not permitted

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and site area for conditions that might prevent satisfactory installation.

B. Verify that dimensions of supporting structure are within plus/minus 1/8 inch of dimensions shown on shop drawings.

C. Verify that all adjacent painting, roofing, masonry work, and other work that might damage finish has been completed prior to installation of sun screens.

D. Do not install until after all adjacent painting, roofing and masonry have been completed.

E. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. Set units level, plumb, with uniform joints, and aligned with building elements.

C. Separate dissimilar metals using concealed bituminous paint or non-absorbent gasket.

D. Anchor units to structure as indicated on the drawings.

E. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.

F. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.03 TOLERANCES

A. Maximum Variation from Level/Plumb: Plus/Minus 1/8 inch.

3.04 CLEANING

A. Clean exterior surfaces units of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.05 PROTECTION

A. Protect units after installation to prevent damage due to other work until the Date of Substantial Completion.

END OF SECTION

SECTION 10 7500
FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete base and foundation construction.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

B. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2016.

1.04 SUBMITTALS

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

B. Product Data: Provide data on pole, accessories, and configurations.

C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

D. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules.

1.05 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. External Halyard System: Provide manufacturers standard halyard system, including:
   1. Provide flash collar of spun aluminum.
   2. Provide finial ball 6" in diameter of 14 gauge, spun aluminum on each flagpole.
   3. Provide truck assembly on each flagpole consisting of cast aluminum assembly with ball bearing non-fouling, revolving double truck.
   4. Provide cast aluminum cleats, 9" long, two per flagpole, with aluminum fastenings.
   5. Provide two continuous 3/8" diameter braided nylon halyards per flagpole, each with two bronze snaps with neoprene or vinyl covers.
   6. At each cleat, provide a cast aluminum cover with hasp for padlock, staple, and tamper-proof screws.
   7. Finish exposed surfaces to match the flagpoles.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. Acme Flagpoles Company, Division of Lingo, Inc.: www.acmelingo.com.
   2. American Flagpole: www.americanflagpole.com.
   3. Babcock-Davis Associates, Inc.: www.babcock-davis.com.
   4. Concord Industries, Inc: www.concordindustries.com.
   5. Morgan-Frances Flagpoles: www.morgan-frances.com

6. Pole-Tech Co., Inc: www.poletech.com.
7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FLAGPOLES

A. Flagpoles:
   1. Material: Aluminum.
   2. Design: Cone tapered.
   3. Mounting: Ground mounted type.
   4. Outside Butt Diameter: 6 inches.
   5. Outside Tip Diameter: 3.5 inches.
   6. Nominal Wall Thickness: 156 inches.
   7. Nominal Height: 30 ft; measured from top of base. Where more than one pole is located in a group, all poles shall be 30 ft. high.
   8. Halyard: External type, electric operation.

B. Performance Requirements:
   1. Structural Performance: Provide flagpoles capable of withstanding the effects of wind loads as determined according to NAAMM FP 1001, Guide Specifications for Design of Metal Flagpoles.
   2. Base flagpole design on maximum standard size nylon flag suitable for use with pole or flag size indicated, whichever is more stringent.

2.03 POLE MATERIALS

A. Aluminum: ASTM B221 (ASTM B 221M) , 6063 alloy , T6 temper.

2.04 ACCESSORIES

A. Finial Ball: Aluminum, 6 inch diameter.

B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.

C. Cleats: 9 inch size, aluminum with stainless steel fastenings, two per halyard.

D. Cleat Box: Aluminum, with built-in hinge and hasp assembly, attached to pole with tamper proof screws inside box.

E. Halyard: 5/16 inch diameter nylon braided with steel or bronze core.

F. Connecting Sleeve For Multiple Section Poles: Same material as pole, precision fit for field assembly of pole, concealed fasteners.

2.05 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gage, 0.0598 inch steel, galvanized, depth of 36 inches.

B. Lighting Ground Rod: 18 inch long copper rod, 3/4 inch diameter.

C. Lightning Ground Cable: Copper No. 6 AWG, soft drawn.

2.06 FINISHING

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Aluminum: Anodized to Class 1, black color

C. Finial: Spun Aluminum finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

B. Fill foundation tube sleeve with concrete specified in Section 03 3000.

C. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 10 8213
ROOF SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stand-alone roof equipment screens and supporting steel framework. Screens shall be designed to attach to the equipment being screened and not the roof structure.

B. Roof screen accessories.

1.02 RELATED SECTIONS

A. Section 051200 - Structural Steel: Metal Framing.

B. Section 053100 - Steel Decking.

C. Section 055000 - Metal Fabrications: Frames and supports.

D. Section 077213 - Roof Curbs.

E. Section 099100 - Paints and Coatings: Field applied paint finish.

F. Division 23 - Roof Top HVAC Equipment.

1.03 REFERENCES

A. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

D. ASTM A 1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

E. ASTM B 749 - Standard Specification for Lead and. Lead Alloy Strip, Sheet, and Plate Products.

F. ASTM D 4811 - Standard Specification for Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing.

G. ASTM D 6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.

H. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

J. AWS D1.1 - Structural Welding Code - Steel.

K. AWS D1.6 - Structural Welding Code - Stainless Steel.

1.04 COORDINATION

A. Coordinate Work with other operations and installation of roofing materials to avoid damage to installed insulation and membrane materials.

1.05 ACTION SUBMITTALS

A. Submit under provisions of Section 013000.

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. Installation methods.

C. Shop Drawings: Layout and erection drawings showing typical cross sections and dimensioned locations of all frames and base supports. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, shape, and patterns.

1.06 INFORMATIONAL SUBMITTALS

A. Design Calculations: 3 copies of structural design calculations for structural components and components resisting wind loads with seal and signature of professional engineer licensed in the State of Texas

B. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

D. Warranties: 3 signed copies.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum five years documented experience in producing pre-manufactured metal-framed equipment screens.

B. Design Qualifications: Provide structural design calculations stamped by a professional engineer licensed in the state in which this project is located.

C. Welders: AWS certified within previous 12 months.

D. Pre-Installation Meeting:
   1. Convene at job site, at least seven calendar days prior to scheduled beginning of construction activities of this section, to review requirements of this section.
   2. Require attendance by representatives of the installing subcontractor (who will represent the system manufacturer), the mechanical subcontractors and other entities affected by construction activities of this section.
   3. Notify Architect four calendar days in advance of scheduled meeting date.

E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Locate in area designated by Architect.
   2. Construct mock-up, one full screen section wide, including two roof supports.
   3. Do not proceed with remaining work until workmanship, color, and location is approved by Architect.
   4. Remove mock-up if required by Architect.
   5. Accepted mock-up may remain in place.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site clearly marked for proper identification.

B. Receive, handle and store materials in conformance with the manufacturers printed instructions.

C. Store products under cover, in manufacturer's unopened packaging until ready for installation.

D. Protect materials from exposure to moisture.

E. Store materials in a dry, warm, ventilated weathertight location.

F. Protect metal fabrications from damage by exposure to weather.

G. Handling: Use a forklift or crane to move material. Do not lift the bundles by the metal bands.
   1. Fork Lift: Spread the forks as far as possible to balance the load. Drive slowly when moving long bundles over uneven surfaces to avoid tipping the load
   2. Crane: Position the canvas sling straps so that the space between the straps is at least 1/3 the length of the bundle. Use sling straps with looped ends running one end of the strap through the loop at the other end to cinch the bundle when lifted. When setting the load on the roof, put wood blocks under it to protect the roof and allow space to remove the sling straps.
   3. Roof Placement: Spread the bundles and crates out as much as possible to avoid overloading the roof structure. Place the material directly over major supports such as beams or trusses.
   4. Position bundles of tubing parallel to the slope of the roof and block prior to opening to prevent the tubing from rolling down the roof slope when unbundled.

1.09 PROJECT 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.

B. Field Measurements: Verify roof screen dimensions and conditions of the installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.10 WARRANTY

A. Framing System: Provide manufacturer's standard written limited warranty stating that the complete framing system shall be warranted against structural failure due to cracking, buckling, bending, tearing or corrosion arising under normal use and environmental conditions for the coverage period applicable.
   1. Products installed on projects located 2 miles or greater from salt or brackish bodies of water shall be warranted for twenty (20) years
   2. Products installed on projects located greater than 1 mile but less than 2 miles from salt or brackish bodies of water will be warranted for five (5) years, except for aluminum, stainless steel or copper Products which will be warranted for twenty (20) years.
   3. Products installed on projects located 1 mile or less from salt or brackish bodies of water will be warranted for three (3) years, except for aluminum, stainless steel or copper Products which will be warranted for twenty (20) years

B. Panel Finish:
   1. Provide written warranty stating that the paint finish applied on all equipment enclosure panels will be warranted against chipping, peeling, cracking, fading, or blistering for the coverage period of twenty (20) years.
   2. Provide warranty signed by the panel manufacturer and paint finish applicator (if separate from manufacturer).

C. The above warranties are in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Design Loads: Comply with Building Code for site location and building height.
   1. Design to resist ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
   2. Design all materials, assembly and attachments to resist snow, wind, suction and uplift loading at any point without damage or permanent set.

B. Structural Design: Prepare structural design calculations for screen framing and attachment to structure including reactions at base supports for verification of roof structure by Architect.

C. All welds to be performed by an AWS certified welder. Valid certification to be provided.

2.02 MANUFACTURERS

A. CME Screening: www.rooftopscreening.com

B. CityScapes Inc.: www.cityscapesinc.com.

C. Substitutions: See Section 01 6000 – Product Requirements

2.03 MATERIALS

A. Exterior: Screening shall be constructed of high ribbed, color fast, 26 gauge steel siding and trim. 30% siliconized polyester.
   1. Color: Refer to Section 01 6210 Schedule of Materials and Colors.

B. Structure: Welded light weight aluminum custom design to fit each unit's access points with removeable doors.

C. Mounting: Screening structure is supported by roof top unit at each of the four corners. Intermediate supports shall be provided on all sides of screening greater than 140".

D. Free Air Clearance: Free air space at the bottom of the screening shall be a minimum of 3" less than the curb height less applicable roofing.

2.04 FABRICATION

A. Fabricate ends of tubing with flat crimp for connections.

B. Fit and shop assemble items in largest practical sections, for delivery to site.

C. Fabricate items with joints tightly fitted and secured.

D. 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.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

F. Fabricate system components so that portions of screen can be dismantled for repairs to equipment being screened and for future roof replacement.

G. Trim and Closures: Fabricated from 24 gauge metal and finished with the manufacturer’s standard coating system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine area where work will be installed to verify the installation can be performed in accordance with the Drawings and structural calculation requirements without interference from other equipment or trades.

B. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Do not begin installation until conditions have been properly prepared.

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. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Provide for erection loads, and for sufficient temporary bracing to maintain indicated alignment until completion of erection and installation of permanent attachments.

D. Separate dissimilar metals and use gasketed fasteners, isolation shim, or isolation tape to eliminate possibility of corrosive or electrolytic action between metals.

E. Exercise care when installing components so as not to damage finish surfaces. Touch up as required to repair damaged finishes.

3.04 CLEANING AND PROTECTION

A. Remove all protective masking from framing and trim material immediately after installation. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. Maintain in a clean condition during construction.

B. Protect installed products until completion of project.
   1. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
   2. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Architect.

C. Prior to Substantial Completion: Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.

D. Replace metal wall panels and framing members that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 11 2336
COMMERCIAL APPLIANCES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Commercial Ice Machines

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete

B. Division 22 - Plumbing

C. Division 23 - Heating, Ventilating and Air-Conditioning

D. Division 26 - Electrical

1.03 SUBMITTALS

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

B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.04 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. The contractor shall furnish a written guarantee warranting all materials, devices, equipment and workmanship to be free of defects for a period of one (1) year from the date of completion and acceptance. Any defects in materials, devices, equipment and workmanship which become apparent within the guarantee period shall be repaired and replaced by the contractor at his own expense and at no additional cost to the Owner.

C. After the above one (1) year period of guarantee, the equipment shall be guaranteed for five (5) years in accordance with standard warranties as offered by the manufacturer.

PART 2 – PRODUCTS

2.01 EQUIPMENT MANUFACTURERS

A. Ice-O-Matic (Commercial Ice Machines): www.iceomatic.com

B. Manitowoc Foodservice (Commercial Ice Machines): www.manitowocice.com

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMMERCIAL ICE MACHINES

A. Provide the following products:
   1. Model: Scotsman, Prodigy Plus N0422 – B530S
      a. Production: 24 Hour Yield: 400 lbs.
      b. Condenser: Air
      c. Cube Size/Type: Nugget (Sonic Ice)
      d. Storage Capacity: 400 lbs. min
      e. Electrical Requirements: 115/60/1

2. Accessories:
    a. Water Filter:
        1) Prefilter:
            (a) E-10 Prefilter System: EV9795-80.
            (b) Everpure EC110 Prefilter Cartridge: EV9534-12
        2) Filter:
            (a) Insurice Single - i20002 System: EV9324-01.
            (b) i20002 Replacement Cartridge: EV9612-22.

PART 3 – EXECUTION

3.01 INSTALLATION

A. This contractor shall do all fitting, fastening, connecting, leveling and placing of all Equipment as required to complete each item in its permanent position.

3.02 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstrate proper operation of equipment to Owner's designated representative.

3.03 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform systems startup.

B. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.

C. Adjust for proper operation within manufacturer's published tolerances.

END OF SECTION

SECTION 11 3013
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Laundry appliances.

1.02 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

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. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

C. Gas Appliances: Bearing design certification seal of American Gas Association (AGA).

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Manufacturer, agreeing to repair or replace equipment that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

C. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.
   1. Frigidaire Professional: www.frigidaire.com
   2. General Electric Appliances: www.geappliances.com.
   3. KitchenAid Appliances: www.kitchenaid.com
   4. Summit Appliance: www.summitappliance.com
   5. Whirlpool Corporation: www.whirlpool.com.
   6. Substitutions: Under provisions of Section 01 6000 – Product Requirements.

2.02 KITCHEN APPLIANCES

A. Refrigerator: Free-standing, top-mounted freezer, and frost-free.
   1. Basis of Design: GE, Model# GIE21GSHSS
   2. Capacity: Total minimum storage of 21.2 cubic ft; minimum 15 percent freezer capacity.
   3. Features: Include glass shelves, automatic icemaker, and light in freezer compartment.
   4. Exterior Finish: Stainless steel.

B. Under-counter Ice Maker (ADA Compliant Height)

1. Basis of Design: Scotsman, Model# UN0815
2. Controls: Auto defrost.
3. Surface: Stainless Steel
4. Dimensions: 15" wide with floor mount kit to fit under 34" high counter.
5. Capacity: 79 lbs.

C. Range: Electric, free-standing, with glass-ceramic cooktop.
1. Basis of Design (Electric - ADA): GE, Model# JS645SLSS
2. Size: 30 inches wide.
3. Oven: Self-cleaning.
4. Burners: Four (4).
5. Controls: Push-to-turn knobs with electronic clock and timer.
6. Features: Include storage drawer, oven door window, oven light, and safety control lock out function.
7. Exterior Finish: Stainless steel.

D. Cooking Exhaust: Range hood.
1. Size: 30 inches wide.
2. Fan: Two-speed, 300 cfm
3. Exhaust: Recirculating.
4. Features: Include cooktop light and removable grease filter.
5. Exterior Finish: Stainless steel.

E. Dishwasher: Undercounter. (ADA Compliant Height - Must fit under 34" high counter)
1. Basis of Design: GE, Model# GDT225SSLSS
2. Controls: Solid state electronic.
3. Wash Levels: Three (3).
4. Cycles: Three (3), including normal and heavy or light wash.
5. Features: Include rinse aid dispenser, optional no-heat dry, optional water temperature boost, adjustable upper rack, and adjustable lower rack.
6. Finish: Stainless steel.

2.03 LAUNDRY APPLIANCES

A. Combination Stacked Washer/Dryer
1. Basis of Design: GE, Model# GUD27ESSJWW
2. Washer Capacity: 3.2 Cubic foot
   a. Surface/construction: Porcelain on steel, porcelain tub
   b. Features: 11 cycle, 4 water levels, 6 temperature settings, sound insulation
3. Dryer Capacity: 5.9 Cubic foot
   a. Surface/construction: Porcelain on steel, cold rolled steel drum
   b. Features: 4 cycle, sound insulation
4. Controls: Rotary controls
5. Dimensions: Depth: 31 in., Height: 75.5 in., Width: 27 in.
6. Color: Painted steel, color white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 11 4000
FOODSERVICE EQUIPMENT

PART 1 - GENERAL

WORK INCLUDED:

The work covered includes the furnishing of all labor, materials, accessories, and special services necessary to complete the Foodservice Equipment Work as specified herein and where shown and scheduled on the drawings.

It is the intent of the Contract Documents for each and every item and/or component to be complete with all necessary devices for the Item and/or component to properly function and perform in a manner equal to the manufacturer's stipulations.

The applicable provisions of Division 22 and 26 are a part of this specification; the Contractor shall consult them in detail for instructions pertaining to this work, together with all other Divisions relative hereto.

The work shall include, but not be limited to, the following:

1. The purchase and/or fabrication, delivery, unpacking and setting up of all items in the correct locations and make ready for final utility connections.

2. Removal and disposal of all crating and packing materials.

3. Furnishing Division 26 with all controls for items requiring electrical connections including as hereinafter noted, or shown on the Contract Drawings.

4. Furnishing Division 22 with the control valves, pressure reducing valves, faucets, and specialty fittings as hereinafter noted, or shown on the Contract Drawings.

5. Supervising the mechanical and electrical connections and testing each item for performance, and the replacement of any item, which fails to perform as claimed by the manufacturer.

6. Start-up and Demonstrations are to be conducted in the proper operation and maintenance of each piece of equipment by Manufacturer’s Representative and Equipment Supplier. When possible and available by the manufacturer, training videos are to be provided at no charge to the Owner.

RELATED WORK SPECIFIED ELSEWHERE:

All plumbing, electrical and ventilation work required in connection with this equipment will be done by Contractors under Division 22 and 26 unless specifically called for otherwise in the Item Specifications. The work to be done by these Contractors shall include roughing-in to points indicated on dimensioned utility requirements rough-in plans, mounting of trim items such as faucets, sink wastes, pre-rinse sprays, syphon breakers, and the final connecting from the roughing-in point to the various pieces of equipment requiring such connections, and the supplying of all necessary materials and labor for this work except as hereinafter noted.

Refrigeration work shall be done by the Food Service Equipment Supplier as hereinafter listed in the Item Specifications, except for electrical and plumbing connections to compressors, blower coils, controls, etc. These final connections will be made by Contractors under Divisions 22 and 26. Drain lines from Walk-In Cooler/Freezer blower coils and heat tap on freezer drain to be furnished and installed by Refrigeration System Installer.

All traps, grease traps, line strainers, valves, stops, shut-offs and fittings necessary for equipment specified will be furnished and installed under the Mechanical Contractors under Division 22, unless specifically called for otherwise under each item.

All line and disconnect switches, safety cut-offs and fittings, convenience outlets, outlet boxes, wiring, conduit, control panels, fuse boxes or other electrical controls, fittings and connections will be furnished and installed under Electrical Contractors under Division 26. Starting switches are to be provided by the Food Service Equipment Supplier. Those starting switches furnished loose as standardized by Food Service Equipment Manufacturers (other than fabricated items) shall be mounted and wired complete by Contractors under Division 26.

Any sleeves or conduit required for installation of refrigeration lines, syrup lines or CO2 tubing will be furnished and installed by Mechanical Contractors under Division 22.

Necessary stainless steel seamless exhaust ducts of size and capacity required to operate fixtures specified, together with final approved connection between roughed-in vent openings and the ceiling connection will be furnished and installed by Food Service Equipment Supplier unless otherwise noted in the Itemized Specifications.

Ventilating fans and all duct work between same and the exhaust hood duct collars and from same to discharge opening in building will be furnished and installed by Contractors under Division 22.
Division 22 Contractor is to see that all plumbing lines are flushed free of foreign matter before connecting to foodservice fixtures.

Water inlets shall be located above the positive level to prevent syphoning of liquids into the potable water system. Wherever conditions shall require submerged inlet, a suitable approved type of check valve, vacuum breaker and/or RPZ shall be placed on the fixture by the Contractor under Division 22 to form part of same to prevent syphoning. If exposed and design dictates, piping and fittings shall be chrome plated.

Contractor under Division 26 shall inter-wire fire protection system, walk-in coolers and freezers, exhaust ventilators, lights, exhaust fans, as required for complete operation as designed, and furnish wall mounted light and exhaust fan switches.

QUALITY ASSURANCE:

Qualification of Suppliers: Commercial foodservice equipment suppliers shall submit satisfactory evidence of compliance with the following qualifications and conditions to be approved.

Successful completion of jobs of comparable scope.

Have manufacturer's authorization to distribute and install specified factory items of equipment.

Maintain a permanent staff experienced in the installation of foodservice equipment and preparation of professional style shop drawings and brochures.

Maintain or have access to fabrication shop meeting all requirements of the section “Qualified Fabricators”.

Maintain or have access to a readily available stock of repair and replacement parts, together with authorized service personnel.

Operation/Maintenance Manuals: Foodservice equipment supplier shall furnish three (3) bound sets (unless specified otherwise by Division 1) of dimensional prints, data sheets, spare parts lists, and operating instructions for each piece of mechanical equipment. These are to be

prepared and submitted to the Consultant for review and approval before demonstration of equipment to the Owner.

All brochures shall be bound in hard durable covers bearing the job name and date of submission.

PLANS AND SPECIFICATIONS:

Specifications and drawings have been prepared to form the basis for procurement, erection, start-up and adjustment of all equipment in this contract. Plans and specifications shall be considered as mutually explanatory and work required by one, but not by the other, shall be performed as though required by both. Items required by one, but not by the other should be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings, so that all items of equipment shall be completely functional for purpose for which they were designed. When the drawings disagree in themselves, or the specifications with the drawings, bidders should seek clarification of any discrepancies by way of request for information (RFI) from the Architect/Consultant prior to bidding. If clarification cannot be obtained prior to bid date, the better quality, more stringent, and/or greater quantity of the work or materials shall be quoted disclosing the discrepancy and clarification obtained after the bid date.

SUBMITTALS:

Submittals shall be sent to the General Contractor/Construction Manager for review, coordination and processing completely in Adobe PDF format with one (1) printed copy for the consultant. Submittals shall be complete including all drawings and documentation necessary for a complete review. Partial submittals will not be accepted. This submittal is to be within terms set by Architect and to coincide with job conditions and is to include the following items:

A. Equipment arrangement plan

B. Plumbing plan

C. Electrical plan

D. Ventilation plan

E. Special conditions plan

F. Shop drawings

All drawings to be original prepared detailed arrangement plans from Architect's dimensioned plans (not reproduced from the Food Service Contract Documents) and rough-in plans showing dimensioned locations, sizes, elevations and capacities of all utility services required for each item of equipment. Also, provide utilities listed per Contract Documents for general use. All responsibility for correct voltage, locations, capacities and quantities of all utility services resides with the Food Service Equipment Supplier in the preparation of these submittals.

Items A through E above shall be prepared at ¼" to 1'-0" scale.

Item F shall be prepared 3/4" to 1'-0" scale with sections at 1-1/2" to 1'-0" scale.

It is advised that Foodservice Equipment not be ordered until submittals have been reviewed and stamped by Foodservice Equipment Consultant.

Product data brochures complete with:

Cover Page listing name of project, Architect, General Contractor/Construction Manager, Food Service Equipment Consultant and Food Service Equipment Supplier and bound in loose-leaf manner such as three ring binder or spiral back brochure.

Index of Items.

Individual descriptive cover sheet to include Item #, manufacturer, description, accessories and options, finishes, and notes for Architect/Owner to select any color, finish, lettering etc. required. Include color charts if color selection is required.

Manufacturer specification sheet complete with dimensions, options, and complete description of utility options and requirements.

For custom fabricated items, list name of Qualified Fabricator selected for project.

Cover sheet must be included for Items that are Owner or Vendor furnished and Spare Numbers.

Buy out items such as walk-in cooler/freezer, exhaust hood, sneeze guards, serving counters, and floor troughs shall be prepared on sheet sizes and in the same manner as custom fabricated equipment.

All data shall be submitted in quantities as described in Division 1.

PRODUCT DELIVERY, STORAGE AND HANDLING:

Delivery: Equipment shall be delivered only after the building is weather and vandal safe.

Storage: Store equipment in an area convenient to the point of installation in such a way that it can be protected from the weather and job hazards.

Protection: Wrapping and protective coverings shall remain on all items until ready for use and in the case of stainless steel items, until installation is complete and the job is ready for cleaning.

JURISDICTION TRADE AGREEMENTS AND RESTRICTIONS:

Include the work specified, shown or reasonably inferable as part of foodservice equipment. Portions of this work may be sub-contracted to those qualified to do such work, as may be necessary because of jurisdictional trade agreements and restrictions.

REGULATIONS AND CODES:

In addition to complying with applicable laws, statutes, building codes and regulations of local public authorities, comply with the following:

National Sanitation Foundation (to bear label)

Underwriters' Laboratories, Inc.

American Gas Association Laboratories

National Fire Protection Association

Occupational Safety and Health Act

Americans with Disabilities Act

Texas Accessibility Standards

Current Applicable Building Code

Current Applicable Plumbing Code

Current Applicable Mechanical Code

Current Applicable Electrical Code

WARRANTIES:

Warrantee in writing all equipment and fabrication against defects and workmanship for a period of one (1) year from date of acceptance.

Each piece of mechanical equipment shall be listed, together with the authorized service and repair agency, which the Owner should call should malfunctions occur within the one (1) year guarantee period.

Refrigeration system compressors shall be CFC free and warranted for five (5) years by the manufacturer. Free refrigeration service, including parts and labor, to be furnished for one (1) year from date of acceptance.

PART 2 – PRODUCTS

MATERIALS:

Refrigeration Systems: Self-contained refrigerators: Whether the units are top mounted or cabinet mounted, they shall be started by Food Service Equipment Supplier and shall be tested for maintenance of temperature.

Fractional-horsepower compressors remotely installed within a fabricated closed base body fixture shall be located in a partitioned compartment fitted with a louvered door. The compressor shall be securely anchored to #14 gauge galvanized steel channels positioned 4" above the bottom of the fixture body and fitted with sound absorbing isolation pads.

A cord and cap assembly pre-wired to a control switch installed near the front of the compressor compartment shall be provided.

MOTORS AND HEATING ELEMENTS:

Motors: Up to and including 1/2 H.P. shall be wired for 120 volt, single-phase service. Motors larger than 1/2 H.P. shall be wired for 208 volt, single or three phase as indicated.

Heating elements having a connected load up to and including 1000 watts shall be wired for 120 or 208 volt, single phase service, or as indicated on the design drawings.

Any heating element larger than 1000 watts or any combination of elements in one fixture totaling more than 1000 watts shall be wired for 208 volt, single or three phase service, as indicated on the design drawings.

Fixtures having multiple heating elements may be wired for three (3)-phase service with the load balanced as equally as possible within the fixture.

Wiring shall be properly protected in NEMA and UL approved metal enclosures.

Switches and Controls:

Each motor driven appliance or electrically heated unit shall be equipped with a suitable control switch or starter of a type meeting the requirements of NEMA and UL codes.

All controls mounted on vertical surfaces of fixtures shall be set into recessed die stamped stainless cups or other approved indentations.

Faucets, Valves and Fittings:

All sinks shall be equipped with chromium plated, swing spout faucets equal to T. & S. Brass and Bronze Works, Inc., #B-0231-EE*J088 or #B-0290-LL*J088 units for splash mounted or #B-0221-EE*J088 deck mounted, unless otherwise specified in the Item Specifications.

Specialty faucets will be listed under Item Specifications.

For all other fittings, refer to Division 22.

Comply with ANSI / NSF Standard 61 Requirements.

METALS AND ALLOYS:

Non-corrodible Alloy: Shall be stainless steel, Type #304, U.S. standard gauges as indicated. All exposed surfaces shall have a #4 finish. Surface finish marred by manufacture shall be ground smooth, polished and restored to match original finish.

Galvanized Metal: Where galvanized metal is specified, it shall be copper-bearing galvanized iron, Armco, Toncan, or equal, re-rolled for smoothness and used in the largest possible sizes with as few joints as necessary.

Hardware and Casters:

All hardware shall be of a heavy-duty type, satin finished chromium plated brass, cast or forged or hi-lited stainless steel of uniform design. All hardware shall be a well-known brand, and shall be identified by the manufacturer's name and number for easy replacement of broken or worn parts.

Casters on custom-built equipment shall be heavy-duty type, ball bearing, and solid or disc wheel, with grease-proof rubber, neoprene, or polyurethane tire. Wheel shall be 5" diameter, minimum width of tread 1-3/16", minimum capacity per caster 250 pounds, unless otherwise noted.

Solid material wheels are to be provided with stainless steel rotating wheel guard.

All casters shall have sealed wheel and swivel bearings, polished plated finish and be N.S.F. approved.

Tempered Glass:

Fully tempered glass to be used in place of other glass products on all manufactured and custom fabricated equipment. All tempered glass to bear the etched logo indicating tempered glass and the manufacturer’s number. The manufacturer to meet the requirements of ANSI Z97.1 standard and federal standard CPSC16CFR 1201, as well as state and local codes, safety glazing material where the glazing might reasonably be exposed to human impact. Applicable codes should be checked for specific information and requirements.

Handling and installation of tempered glass should receive the same as annealed glass. Careless handling and improper installation sometimes produces edge damage. The tempered glass should be replaced if there is such damage. Tempered glass cannot be cut or modified following heat treatment.

Provide a beveled or radius edge around the parameter of the tempered glass to eliminate all sharp areas that may cause injury to a person.

Laminated Plastic:

Wherever laminated plastic materials are specified for cabinetwork, counter or top facings, they shall be Formica, Parkwood, Nevamar, or approved equal. All material to be veneered with Urea based cement, waterproof and heatproof.

Material to be applied directly over ¾" marine grade plywood or close-grained plywood such as solid Mahogany or solid Birch, of selected smooth sanded stock to ensure a smooth ripple-free laminated surface where approved by Consultant.

Exposed faces and edges faced with 1/16" material and corresponding back faced with approved backing and balancing sheet material. Top sheet shall be placed on and over finished edge.

Rubber based adhesives are not acceptable.

Standard Fir plywood is not acceptable.

Thermometers:

All fabricated refrigerated compartments shall be fitted with dial type thermometers with chrome plated flush bezels. Thermometers shall be adjustable and shall be calibrated after installation.

Water Piping:

All manufactured and fabricated items having internal or external water piping are to be copper with welded connections or connections using lead free solder except for ice bins which are to be PVC.

All exposed copper supply and drain lines unless specified otherwise, shall be painted with chrome or aluminum paint.

FABRICATION AND MANUFACTURE:

Materials and Workmanship: Unless otherwise specified or shown on drawings, all material shall be new, of best quality, perfect and without flaws. Material shall be delivered and maintained on job in an undamaged condition.

Fabrication shall be equal to the standards of manufacture used by all first class equipment manufacturers, performed by qualified, efficient and skilled mechanics of the trades involved.

All items of standard equipment shall be the latest model at the time of delivery.

All fabricated work shall be the product of one manufacturer of uniform design and finish.

Sanitary Construction:

All fabricated equipment is to be constructed in strict compliance with the standards of the National Sanitation Foundation as outlined in their bulletin on Food Service Equipment entitled "Standard No. 2" dated October, 1952, and in full compliance with the local and State Public Health Regulations in which the installation is to be made.

All fabricated equipment shall bear the seal of approval of the National Sanitation Foundation.

Construction Methods:

Welding:

Stainless steel shall be arc welded with stainless steel electrodes. Welds shall be non-porous, free of pits and flaws, peened to remove flux and other impurities and ground smooth. Field joints necessary for delivery and assembly are to be solid welded by using the same materials and method as for shop welding. Field welded joints shall be ground smooth without dips and irregularities and finished to match original finish.

Bolt, Screw and Rivet Construction:

Wherever bolts are used to fasten trim to the paneling and body of equipment or to secure any exposed sheet metal surface, such bolts shall be of the concealed type.

Stainless steel bolts and screws of the same alloy composition, as the metal to which they are fastened shall be used.

Wherever threads of bolts and screws occur on the inside of fixtures and are either visible or might come in contact with a wiping cloth, such bolt or screw threads shall be capped with a suitable washer and stainless steel or chrome acorn cap nut.

If rivets are used to fasten rear paneling to the body of the fixture, such rivets shall be stainless steel. In no case shall iron or aluminum rivets be used.

Sound deadening:

Schnee Butyl-Sealant 1/2" wide rope continuously between all frame members and underside of stainless steel table tops, over shelves and under shelves.

Tighten stud-bolts for maximum compression of sealant.

Hi-Liting:

When hi-lited finish is specifically indicated on Elevations, Details and/or Item Specifications for horizontal edges of stainless steel tops, splashes, raised rolled rims, shelf edges, exposed doors, and handles, the Standard #4 finish shall be ground to #240 grit and shall be polished with compound to ensure mirror finish.

Painting:

All fixtures, unless made of stainless steel, shall be finished in gray hammertone enamel, glossy and without blemish.

All materials shall be of the highest quality, air dried and applied in accordance with manufacturer's directions.

Where baked enamel finishes are specified, they shall be oven baked on the fixtures for a minimum of 1-1/2 hours at a minimum temperature of 300 degrees Fahrenheit.

Construction:

Table Frames:

All tubular stands for open base tables or dishtables shall be constructed of 1-5/8" O.D. stainless steel tubing, with stringers and cross braces of the same material.

All joints between legs and cross braces shall be welded and ground smooth, full 360 degree.

The top end of legs shall be closely fitted into fully enclosed gusset no less than 3" high, Component Hardware Group, Inc., model #A20-0206*J088 stainless steel or approved equal.

Gussets to be fully welded to top hat channel reinforcing members, turned so set screw is not visible from the front.

Crossrails must be supplied to reinforce each leg on all tables not having stainless steel undershelves.

Legs anchored to gussets at top only and without crossrails are not acceptable except in the case of sinks.

Feet and Counter Legs:

All tubular legs will be swedged for appearance and close fit to Component Hardware model #A10-0851*J088, or approved equal, stainless steel bullet shaped foot having a slightly rounded bottom to protect the floor.

Top of feet to be fitted with a male threaded stem to fit into the legs and provide a total adjustment of 2" without threads being exposed.

Bottom of tubular leg to be finished off smoothly to provide a sanitary fitting and prevent the accumulation of grease or other debris at this joint.

Cabinet type fixtures, unless otherwise specified, shall be mounted on 6" high die-stamped sanitary two (2) piece stainless steel counter legs not less than 2-3/4" diameter at top. All counter legs are to be Component Hardware model #A72-0811 or approved equal, stainless steel stepped shape having slightly rounded bottom to protect floor and bearing a minimum of 2,000 lbs per leg. All legs are to have one (1) piece die-stamped closed 1-3/8" diameter minimum bottoms to ensure sanitation.

The upper part shall be stamped in a neat design with a flared inverted shoulder and shall be welded to a base plate designed for anchoring to the channel braces below cabinet type fixtures.

Counter legs shall have an adjustment of 6” to 7-3/4" height minimum.

Table Tops (Metal):

Metal tabletops shall have all shop seams and corners welded, ground smooth and polished. All back welds to be peened and ground smooth.

All working tops on closed base fixtures shall be reinforced on the underside with a framework of 1-1/2" x 4" x 1-1/2" galvanized hat channels.

Cross channel closed end members shall be placed at each pair of legs. One angle or channel runner, running lengthwise, shall be provided below tops up to 30" wide.

All tops shall be reinforced so that there will not be any noticeable deflection and all reinforcements shall be stud welded to the underside of the top.

No rivets or bolts to be used through tops.

Field joints shall be provided in tops where necessary and are to be located for practical construction, consistent with sizes convenient for shipping and accessibility into the building.

All metal tops shall be of #14 gauge stainless steel of the quality hereinbefore specified.

All metal tops shall be turned down as required by uniform design except where adjacent to walls or other pieces of equipment The wall side shall be turned up a minimum of 8" and back 2-1/2" as required by uniform project design or as otherwise specified.

Ends of these splashes shall be closed.

Enclosed Bases:

All enclosed bases or cabinet bodies shall be of seamless #18 gauge stainless steel construction, enclosed on the ends and sides as required and called for under each particular item.

Ends of body to terminate at front or operator's side in a 2" wide mullion, vertical, completely enclosed. All intermediate mullions shall be completely enclosed.

The bases shall be reinforced at the top with a framework of 1-1/2" x 1-1/2" x 1/8" galvanized angles, with all corners of said framework mitered and welded solid.

Bottom of tabletop shall be reinforced with channels and gussets where necessary. Additional angles and channel cross members shall be provided to reinforce shelves and support tops.

Where sinks or other drop-in equipment occur, bottom sides of such equipment shall be reinforced with an angle crosswise of the table.

In the case of fixtures fitting against or between walls, the bodies shall be set in 1" or 2" from the wall line, but the tops will extend back to the wall line. This will permit adjustment to wall irregularities.

A vertical trim strip of the same material as the body shall be provided at each end of the fixture to close the gap between the back edge of the body and the wall or preferably the end of the body shall extend back to the wall line.

All free vertical corners of enclosed bodies shall be rounded on 3/4" radius and all corners against walls and other fixtures to be square.

These fixtures shall be fitted with 6" high counter style stainless steel legs as hereinbefore specified.

Sliding Doors

Sliding doors shall be constructed of #18 gauge stainless steel. These shall be made pan-shaped, of double thickness, and without trim. Sliding doors shall have 3/4" thick sound deadening fiberglass or celotex between the two thicknesses of metal and shall operate on quiet top-hung ball bearing rollers. Bottom edge of doors shall be square and fitted with a guide groove that rides in a nylon clip at the center point.

All doors shall be fitted with stops. Doors shall be fitted with pin tumbler type locks, master keyed to other fabricated items if specified under Item Specifications.

Hinged Doors:

All hinged doors for cabinet bodies and enclosed bases shall be constructed of #18 gauge stainless steel. They shall be of double pan construction with sound deadening insulation between the two pans. Doors shall be flush mounted without overlap and shall be fitted with semi-concealed stainless steel hinges or concealed torque-spring self-closing hinge assembly.

Drawers:

All drawer bodies shall be die-stamped out of one (1) piece of #18 gauge steel material of the type and in the size called for in the Item Specifications. Each drawer body shall sit loosely in a channel frame so it can be lifted out for cleaning.

All top edges shall be flanged out 1/2".

All interior horizontal corners are rounded on a 1" radius and all interior vertical corners on a 2" radius.

The supporting frame shall be of welded channel, or material called for in Item Specifications. Drawer face shall be welded to frame so that no screws or rivets will be exposed on the face.

The face shall be of #16 gauge stainless steel insulated die-formed with full-length sanitary handle.

Drawer slides to be Component Hardware Group, Inc., model #S52-series heavy-duty stainless steel full extension type and are to be mounted on the channel frame and fitted with ball bearing stainless steel rollers. Slides and frame shall be reinforced such that the drawer will support a dead weight of 200 pounds when fully extended.

Adjustable stops shall be provided for each drawer at the fully opened position.

Drawers on open base tables shall be fully enclosed in #18 gauge steel housing of material as identified in the Item Specifications.

Locks, where required, shall be cylinder lock assembly. No screws, bolts, or fastening devices penetrating the sides or bottom of the drawer body will be permitted.

Drawer constructed similar to Component Hardware Group, Inc. model #S90-0020-N*J088.

Undershelves:

Unless otherwise specifically called for to be removable, all open base table undershelves to be #16 gauge stainless steel, notched around table legs and fully welded. All edges to have 1-1/2” straight turn down with 1/2” turn back on 15-degree angle, at bottom edge. Underside of shelf to have #12 gauge galvanized hat channel bracing.

Undershelves specified to be removable shall be #18 gauge stainless steel, built in such a way as to be easily removable, using rolled turn down at front and back and at end section so that shelving will fit perfectly over the tubular frame. At end sections or otherwise where table legs occur, corners at legs are to be notched out to form a perfect fit around legs. At intersections of shelving, not over 28” long, shelving to run straight down 1” for strength. If required by width, shelves to have additional angle bracing. All outside turn down corners of removable undershelves to have rounded edges.

Interior Shelves:

Removable interior shelves in cabinet bodies, enclosed bases and overhead cabinets, shall be of #18 gauge stainless steel. Such shelves as called for shall be made in removable sections and rest in 1-1/2” x 1-1/2” x 1/8” stainless steel angle frame, having all horizontal corners coved and constructed in full accordance with N.S.F. requirements.

Stationary interior shelves shall have 2" turn-up on back and ends and shall have joint between shelf turn-up and the body sealed and ground smooth to form a one-piece interior free of any crevices. The front edge shall be flanged down 1-1/2" and under 1/2" and finished with "Z" bar forming completely enclosed edge for maximum strength and sanitation. Shelves further braced with longitudinal centered 1-1/2" x 1-1/2" x 1/8" angle.

Elevated Shelves:

All elevated shelves shall be of #18 gauge stainless steel. All edges shall be rolled or turned down 1-1/2", except where shelves are adjacent to walls or other fixtures where they shall be coved up 1-1/2". All outside corners of rolled edged shelves shall be spherical. All exposed ends and backs of shelves shall be capped.

Shelves shall be mounted on stainless steel wall brackets of tubular, gusset or angle construction as called for in the item specifications.

Shelves may be mounted on 1" O.D. tubular stainless steel tubing with one upright at each corner of the shelf and in center where necessary. Uprights to be fastened to underside of shelf by means of stud-welded bolts and tabletops with concealed fasteners.

Cantilever supports when called for shall have brackets secured to 1-5/8" O.D. stainless steel tubular standards at the back edge of the fixture. These standards are to be carried through the top and are to be securely anchored to the lower framework. Where indicated on drawings, provide Component Hardware #A16-0206*J088 welded sleeves where standards penetrate backsplashes.

Sinks:

All sinks shall be of the size and shape as per plan and constructed of #14 gauge stainless steel. The backs, bottoms and fronts shall be formed on one continuous sheet with the ends welded into place. Partitions for compartment sinks shall be of the same material, electrically welded in place.

Sinks shall have all corners both vertical and horizontal coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.

Unless otherwise specified or detailed, partitions in coved corner sinks shall be of double thickness with a half round 1-1/2" top edge.

Top edges of sinks at front and ends, except where fitted with integral type drainboards, shall be furnished with a 1-1/2" die-formed integral sanitary semi-roll rim.

Across the back of all sinks, unless otherwise specified, there shall be a 10" high splash back measured from rolled edge or approximately 12" from working surface, turned back across the top 2", with ends enclosed.

Unless otherwise specified, two (2) faucet holes on 8" centers are to be provided over the centerline of partitions between compartments, 2-1/2" down from the top of the splash.

Bottom of each compartment shall be pitched or creased to the center drain, and shall be provided with cast brass quick opening drain valve with removable stainless steel strainer equal to Fisher #22306*J088 twist handle drain. Handle to have front stainless steel welded clip support to sink.

Sinks shall be mounted on 1-5/8" O.D. stainless steel tubing legs, and fitted with stainless steel bullet shaped adjustable feet. Legs shall be fitted with die-formed enclosed sanitary closed stainless steel gussets welded to the underside of the sink.

All freestanding sinks shall be 37" high to the top of the front edge and 47" high to the top of the splash. Sink depth from top of front edge to bottom of tub shall be 14" or as otherwise specified. Lengths and widths given shall be overall.

Sink Inserts:

Sink inserts shall be of one (1) piece deep-drawn construction in the size, material and gauge called for in the Item Specifications.

Sinks shall be welded integral with counter tops with no lap between.

Sink will be fitted with a cast brass quick opening drain valve with removable stainless steel strainer as specified or crumb cup drain (Component Hardware #E38-1012*J088) as specified in Item Specifications.

Where sink bowls are exposed, the exterior shall also be polished to a #4 finish.

Sink Drainboards:

Sink drainboards shall be constructed of same material as the sinks and shall be welded integral to same.

Drainboards shall have 2-1/2" high rims with die-formed integral rolled edges to match sink edges.

Front, end, and corners shall be coved on 3/4" radius, as called for in sink specifications, electrically welded, ground, and polished smooth. Solder filleting of these corners will not be accepted.

Drainboards shall be pitched approximately 1/8" per foot to properly drain into the sink.

Dishtable Tops:

These tops shall be #14 gauge stainless steel with all free edges rolled up 3" and finished with 1-1/2" diameter rolled rim and having rounded corners. Edges of dishtables next to high fixtures or walls shall cove up 10" and roll back 2" on 3/4" radius (or as design dictates).

All tables shall slope, and slope shall be built in maintaining vertical crown where adjustable slope is not possible.

All corners of tops shall be coved on 3/4" radius.

Tables to be braced with 1" x 4" x 1" x #12 gauge galvanized hat channels with stainless steel exposed closed ends, between each pair of legs and down center line of top.

Leg gusset to weld to this hat channel and so masked off when sound-deadening material is applied. Gussets to be positioned so that "set-screw" hole is not visible.

Where tops fit to and into dish machines, they shall turn down into, extend up to, and fit watertight thereto.

On exit side of conveyor machines, tables to be provided with 10" high x 12" long sloping integral splashguard constructed of #14 gauge stainless steel (or as design dictates).

Silicon filling of gaps caused by poor fit will not be acceptable.

Counter Style Enclosed Units:

Where these custom fabricated units occur, framing is to be of 1-1/2" x 1-1/2" x 1/8" galvanized angles.

At corners, metal is to be mitered; at other meeting points, metal is to be butted and will conform to the shape of the top and bottom frame metal and then to be solid welded, ground and polished smooth, and repainted as specified.

Provide top and bottom framing for each counter food pan, cold pan, coffee urn, ice cream unit, ice bin, dish dispenser, whether a drop-in unit or a cutout for a portable unit.

Where plate shelves occur, frame horizontally 8-1/2" back from counter edge or as design dictates, and at bottom of shelf at counter edge.

At cut-outs for roll-in equipment, provide top and bottom angles crosswise of the counter 8" above the finished floor.

Base of counter shall be as specified with stainless steel interior shelving constructed as specified.

Counter shall be mounted on approved stainless steel feet as specified.

Top of counter to be of #14 gauge Type #304 stainless steel as called for in these specifications. Metal is to turn down at front and back a full 2" from the top of the top metal or as design dictates.

Such units as are to built in, as an integral part of the counter top will be shown in the Item Specifications. Wherever openings occur for roll-in equipment, the sizes of such openings are to be such as will accommodate the portable equipment plus such protective bumpers as will be required.

Unless counters are specified with plate shelves, metal on working side of counter is to be turned down flush with the bottom of built-in units and back a minimum of 1-1/2" to cover such structural angles as are required.

Front of counter and ends (where exposed) shall be stainless steel, laminated plastic, or other material as required by the Item Specifications.

All display glass shelving shall be set into #18 gauge stainless steel formed channels. Top shelves shall be of the same width as the shelf below. All shelves shall be provided with appropriate sneeze or breath guards having stainless steel protective edges.

The shelves over bread and or pastry sections shall be glass. (All shelving shall be 1/4" polished tempered glass and protected with stainless steel channel edging where specified). The shelves over salad sections shall be glass.

The supporting channels for all glass shelving shall have rubber isolation "buttons" secured to framework of supporting angles.

Serving shelf over hot food sections and/or bread sections shall be #18 gauge stainless steel with lights for the length of the sections.

All display shelving will have lights controlled by switch mounted in base of counter on operator's side. Lights to be of manufacturer and design approved by Consultant and located as design dictates. All lights are to have bulbs covered with plastic shields to meet requirements of local health department.

Such changes as are required in this general counter specification are described in the Item Specifications. The counter or counters shall be internally wired complete by the Food Service Equipment Supplier.

Electric wiring as required shall be installed in such a way as to meet requirements of the Electrical Code of the job location.

Equipment Contractor is cautioned that it will be his responsibility to ascertain requirements of the city and local governing codes that will govern the requirements as described in the specifications:

Trim Strips:

Trim is not an acceptable substitute for accuracy and neatness. When the Consultant elects to accept a trim strip in lieu of rebuilding an item, it is the responsibility of the Food Service Equipment Supplier to provide same at no cost to the Owner.

PART 3 - EQUIPMENT

Manufacturer's names and model numbers are for establishing standards of quality, size and finish required, representing Owner's preference and basis of bid. Alternate Manufacturer’s listed are acceptable only if the specific product can evidence compliance with the specified Item and the Contract

Documents. Bidders are cautioned to examine the electrical and mechanical Contract Documents plans to determine if equipment other than prime, require changes in utilities, space, etc. If changes are required, the bidder shall pay all Architectural, Engineers and Food Facilities Consultant additional cost of necessary changes to Construction Documents that may occur due to accepted alternate. Equipment is listed hereinafter with same Item numbers as shown on the Contract Drawings:

ITEM # 1 REMOTE REFRIGERATION RACK: Provide one (1) Refrigerated Design Technologies Remote Refrigeration Systems model #ZS1-2*J088 air cooled system, including:

A. RDT Remote Refrigeration Systems to install one (1) model #BEL0130*J088 coil with 208 volt, 1 phase defroster and fan motors in freezer. Freezer coil to be controlled and demand defrosted by RDT “Eco-Smart” controller.
B. RDT Remote Refrigeration Systems to install one (1) model #BEC0130*J088 coil with 120 volt, 1 phase fan motors in cooler. Cooler coil to be controlled and demand defrosted by RDT “Eco-Smart” controller.
C. RDT Informant to monitor temperature and power failure in both Freezer and Cooler compartments.
D. RDT Remote Refrigeration Systems air cooled compressor with 208 volt, 3 phase, 1.5 H.P. (ZS11KAE*J088). Scroll Compressor motor to be connected to cooler coil from roof location. Roof pad shall be provided and installed by roofing contractor. Reference Architectural documents for details, actual location and specification.
E. RDT Remote Refrigeration Systems air cooled condensing unit model with 208 volt, 3 phase, 5.0 h.p. (ZF15K4E*J088). Scroll Compressor motor to be connected to freezer coil from roof location. Reference Architectural documents for details, actual location and specification.
F. Pre-wired controls and pre-piped refrigeration accessories. Stainless steel exterior weather removable housing. At each evaporator, Kitchen Equipment Supplier is to provide electrical disconnect on interior of vaults. Refrigeration Installer to provide a tee fitting with cleanout plug and brass union fitting on each evaporator. Do not reduce fittings at drain pan connection. Compressors to have crankcase heaters, main power fused disconnects and winter controls, including fan cycling switches.
G. Size each circuit to balance condensing units and connect to condensing units and coils. Pressure stabilizing valve and by pass manifold on each refrigeration circuit.
H. Walk-ins are to be running and adjusted a minimum of 24 hours prior to the loading of product. Freezer shall be cooled down in stages over 12 hour period. First 6 hour stage to 32°F., then 6 hours to 0° F., finally to –10° F.
I. Type "K" or Type "L" copper refrigerant lines with brazed silver solder joint fittings as required by application. Run refrigerant lines from condensing units to coil penetrations in top of vaults. All to be neat and of highest caliber workmanship. Seal all penetrations with urethane foam to seal air out. See escutcheon and penetration details.
J. R-448A refrigerant charge for freezer and cooler.
K. Armstrong Armaflex 1" insulation to prevent condensation on all refrigeration lines. All joints to be taped and glue sealed. No slit tubing to be used. Fiberglass insulation to be provided if lines are run in air return plenums or if required by local codes. Armstrong Armaflex line insulation on exterior of buildings to be covered with ITW Pabco/Childers (or equal) Aluminum Roll Jacketing manufactured from alloys 3105 and 3003, conforming to ASTM B-209 designation with a minimum thickness of .016”. This is to help prevent deterioration due to sun exposure.
L. Type "L" supported hard copper drain lines with brazed silver solder joints sized as per plan from drain pans below coils to drains, as per plans, furnished and run by Refrigeration System Installer. Provide “Tee” fittings with cleanout plug and brass union fitting on each evaporator. Do not reduce fittings at drain pan connection. Paint all exposed interior drain lines using “All Weather” aluminum paint. Exterior

exposed lines and “P” trap to be chromed. Drain line from freezer coil shall be wrapped with “EZ” heat cable of length as required, provided and installed by Refrigeration Systems Installer and final electrical connection by Electrical Contractor.

M. Electrical Contractor shall wire through defrost control between condensing units and coils and heater cables in freezer. He will connect all light and power connections to controls, motors and lights from rough-in connecting locations on top of vaults. No conduit shall be run on interior of vaults except that required for connection. Electrician to seal all conduit interiors with sealant or foamed urethane after wires are run, to seal out air.

N. RDT Refrigeration Company to check the work of the Electrician and Plumber, in particular the vault wall penetrations and light fixture sealing, and provide one (1) year free service, including parts and labor on refrigeration system and five (5) year warranty on condensing units.

O. Refrigeration system shall be installed by factory experienced mechanics subject to approval of Consultant.

ITEM # 2 AIR CURTAIN: Provide one (1) Mars Air Systems model # LPV248-1UA-OB*J088, LoPro Series 2 Air Curtain, for 48" wide door, Unheated, (1) 1/6 HP motor, 115v/60/1-ph, Obsidian Black powder coated cabinet (Standard Production Color), cETLus certified including;

A. Five (5) year parts warranty, standard.
B. Indoor installation.
C. One (1) model # 99-014*J088, Steel Mechanical Universal Surface-mounted Plunger/Roller Switch.

ITEM # 3 MOP SINK w/ SS WALL FLASHING & MOP RACK: Provide one (1) Advance Tabco model # 9-OP-20-EC-X*J088, Mop Sink, floor mounted, 25"W x 21"D x 10"H (overall), 20"W x 16" front-to-back x 6" deep (bowl size), free flow drain with 2" IPS outlet, stainless steel construction including:

A. One (1) model # K-242-X*J088, Mop Hanger, 23", accommodates three (3) mops.
B. One (1) set Model # K-288R*J088, Right side and back wall splash for 9-OP-20 and 9-OP-40 mop sink (field installed by others), extends 16" above the sink (verify faucet will not interfer.)
C. T & S Brass model #B-0665-BSTP faucet. K.E.C. to verify the need for wall backing.

ITEM # 4 JANITORIAL WALL CABINET: Provide one (1) Advance Tabco model # WCH-15-24-300*J088, Cabinet, wall mount, enclosed design with left-hinged door, 24"W x 15"D, with single fixed intermediate shelf, 18/300 stainless steel construction, slotted side panels for ventilation.

ITEM # 5 STACKED WASHER & DRYER: Provide one (1) lot Whirlpool model #WETLV27HW, 27”, high efficiency, super capacity stacked washer/dryer in the color white, including water hoses, cord with plug and dryer vent kit. Set unit in place per plans and make final connections to utilities per manufacturer’s specifications.
Note: Model number given are current for reference only. Models at the time Qof delivery shall be the current models.

ITEM # 6 SPARE NUMBER:

ITEM # 7 EMPLOYEE SHELVING: Provide one (1) Cambro Camshelving Premium shelving section, including:

A. 54”L x 24”” W x 72”H Stationary Shelving
B. Four (4) tiers of shelves with vented shelf mats
C. One (1) Camshelving Premium dunnage support, 7-1/2” high
D. Vertial posts and horizontal traverses are made of a steel core coated with a smooth polypropylene exterior. Reinforced nylon foot on bottom of each stationary post adjusts easily for floor irregularities.
E. Post connectors and shelves up to 48" long hold up to 800 lbs. evenly distributed static weight. Shelves 54" - 72" long hold up to 600 lbs. each.
F. Molded in dovetails on posts ensure that traverses set easily into place. Shelves and traverses can be adjusted at 4" increments. The shelf traverses can be easily removed and washed in a conveyor dishwasher.
G. Works in temperatures -36˚F to 190˚F. All components are weldless, rust free with no exposed metal. Lifetime warranty against rust and corrosion.
H. Shelf plates are removable and can contain Camguard an antimicrobial technology incorporated throughout the shelf plate material, that will never wash off or wear out, and inhibits the growth of mold, fungus and bacteria.
I. Assembles with the use of a rubber mallet, requiring no bolts or nuts, clips or stainless steel connectors.

ITEM # 8 EMPLOYEE LOCKERS: Employee Lockers By Architectural Division.

ITEM # 9 DRY STORAGE DUNNAGE RACK: Provide one (1) Cambro MODEL #DRS600480*J088 S-Series dunnage rack, including;

A. 60”L x 21” W x 12”H
B. Slotted top, 3000 lb. load capacity, polypropylene, one-piece, seamless double wall construction, includes one (1) Camlink dunnage rack connector, 4" square legs, speckled gray, NSF certified.

ITEM # 10 DRY STORAGE SHELVING: Provide one (1) LOT Cambro Camshelving Premium shelving, including:

A. 72”H stationary posts. Shelving units sized per drawings.
B. Five (5) tiers of shelves with solid shelf mats per shelving section
C. One (1) Camshelving Premium dunnage support, 7-1/2” high per shelving section
D. Vertial posts and horizontal traverses are made of a steel core coated with a smooth polypropylene exterior. Reinforced nylon foot on bottom of each stationary post adjusts easily for floor irregularities.
E. Post connectors and shelves up to 48" long hold up to 800 lbs. evenly distributed static weight. Shelves 54" - 72" long hold up to 600 lbs. each.
F. Molded in dovetails on posts ensure that traverses set easily into place. Shelves and traverses can be adjusted at 4" increments. The shelf traverses can be easily removed and washed in a conveyor dishwasher.
G. Works in temperatures -36˚F to 190˚F. All components are weldless, rust free with no exposed metal. Lifetime warranty against rust and corrosion.
H. Shelf plates are removable and can contain Camguard an antimicrobial technology incorporated throughout the shelf plate material, that will never wash off or wear out, and inhibits the growth of mold, fungus and bacteria.
I. Assembles with the use of a rubber mallet, requiring no bolts or nuts, clips or stainless-steel connectors.

ITEM # 11 F.I.F.O. INLINE FRONT RETURN CAN RACK: Provide two (2) New Age Model 50417*J088, in-line rack, including:

A. First In, First Out Can Rack, stationary design, w/sloped glides for automatic can retrieval, holds (140) #10 cans, front edge turned up, welded alloy construction and NSF approved.
B. Mounted on adjustable stainless steel feet.
C. Lifetime guarantee against rust and corrosion. Five year guarantee against material defects and workmanship.

ITEM # 12 MANUAL CAN OPENER: Provide two (2) Edlund model S-11*J088, Can Opener, manual, stainless steel, with cast stainless steel base, NSF certified, including:

A. Five (5) year limited warranty, standard.
B. One (1) model #ST-93*J088, Rustproof Can Opener Cleaning Tool, stainless steel bristles and stainless scraper.
C. Three (3) model # KT1415*J088, S-11 / U-12 NSF stainless steel knife and gear replacement Kit.

ITEM # 13 INSULATED MOBILE HEATED CABINET: Provide one (1) Alto-Shaam model #1200-UP*J088, Halo Heat® Holding Cabinet, double compartment, on/off simple controller with adjustable thermostats, indicator light, two (2) sets of chrome plated universal side rails, four (4) sets of pan slides, (16) 20" x 12" x 2-1/2" full size pan capacity, heavy stainless steel exterior, five (5") casters; two (2) rigid, two (2) swivel with brakes, EcoSmart®, cULus, UL EPH ANSI/NSF 4, CE, IPX4, TUV NORD, and EAC certified, including;

A. 120v/60/1-ph, 16.0 amps, 1.9kW, 9' cord, NEMA 5-20P.
B. Solid state electronic control, LED display, with patented SureTemp heat recovery system.
C. One (1) model # 55662*J088, Handle Kit, push/pull.
D. Solid door, hinged on left, optional.
E. One(1) model #1775*J088, Water Reservoir Pan, for proofing.
F. One(1) model #1774*J088, Water Reservoir Pan Cover.
G. One(1) model #5012932*J088, Bumper, full perimeter.
H. Twelve (12) pair model #SR-24447*J088, Universal Pan Slide, chrome plated (2 pieces required).

ITEM # 14 WORK TABLE: Provide one (1) Advance Tabco model #SS-306*J088, Work Table, 72"W x 30"D, 14 gauge 304 stainless steel top, 18 gauge adjustable stainless steel undershelf, stainless steel legs and adjustable bullet feet, NSF certified, including;

A. One (1) model #TA-61*J088, Modification to reduce length, 67" LONG.
B. Six (6) feet model #FAB-X*J088, Partial back splash, eight (8") high (per linear foot).
C. One (1) each model #TA-76*J088, Paint on sound deadening under top (supplements standard sound deadening under support channels).
D. One (1) model #TA-23*J088, Welded Set Up Table/Shell Crating (per table).
E. One (1) model #TA-93*J088, Wall Clips, (for 5" & 10" splash only) (per table).
F. One (1) model #TA-96A*J088, Can Opener Provision for openers with bolt on base (customer to provide model number & location) (For locations on front or rear of worktables, TA-22 square edge (no charge) is required, TA-22 not required for locations on either end of table, TA-22 not required on tables with countertop edge, but TA-96C is required on these tables).
G. Six (6) feet model #TA-94*J088, 16 gauge 304 stainless steel undershelf upgrade (per linear foot).
H. One (1) model #TA-95*J088, 16 gauge 304 stainless steel leg upgrade (per table).
I. One (1) model #SHD-2020*J088, Drawer, 20"W x 20"D x 5" deep drawer pan insert, heavy duty, self-closing, stainless steel, NSF certified,,CENTER.

J. One (1) model #TA-227*J088, Splash mounting provision.
K. One (1) model #PT-12S-72*J088, Overshelf, table mounted, single, 72"W x 12"D, stainless steel, uprights of shelf, splash mounted.
L. One (1) model # TA-60*J088, Special Length Modification to reduce size of shelf, 51" LONG and mounted per plan leaving room for Item #28, Hot Water Dispenser.
M. Two (2), model #TA-9A*J088, Rear or end splash for overshelves, one (1") inch high (per linear foot) .
N. One (1) model # K-520*J088, Poly Board & Stainless Steel Sink Cover Holder, accommodates (2) boards 5/8" thick, attaches to legs on work table.
O. Two (2) Tomlinson Industries, model # 1031212*J088, Richlite® Cutting Board, 18" x 24" x 1/2", heat resistant, square edge, packed 6 per case, NSF certified.

ITEM # 15 SOAP DISPENSER: Soap Dispenser Provided by Owner Installed by General Contractor.

ITEM # 16 HAND WASH SINK: Provide one (1) Advance Tabco model # 7-PS-50*J088, Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 stainless steel, with splash mounted faucet, lever drain with overflow, P-trap, wall bracket, NSF, and cCSAus certified.

A. 12” high, welded end splash where indicated on plan.

ITEM # 17 TOWEL DISPENSER: Towel Dispenser Provided by Owner Installed by General Contractor.

ITEM # 18 INSULATED MOBILE HEATED CABINET: Provide one (1) Alto-Shaam model #1200-UP*J088, Halo Heat® Holding Cabinet, double compartment, on/off simple controller with adjustable thermostats, indicator light, two (2) sets of chrome plated universal side rails, four (4) sets of pan slides, (16) 20" x 12" x 2-1/2" full size pan capacity, heavy stainless steel exterior, five (5") casters; two (2) rigid, two (2) swivel with brakes, EcoSmart®, cULus, UL EPH ANSI/NSF 4, CE, IPX4, TUV NORD, and EAC certified, including;

A. 120v/60/1-ph, 16.0 amps, 1.9kW, 9' cord, NEMA 5-20P.
B. Solid state electronic control, LED display, with patented SureTemp heat recovery system.
C. One (1) model # 55662*J088, Handle Kit, push/pull.
D. Solid door, hinged on left, optional.
E. One(1) model #1775*J088, Water Reservoir Pan, for proofing.
F. One(1) model #1774*J088, Water Reservoir Pan Cover.
G. One(1) model #5012932*J088, Bumper, full perimeter.
H. Twelve (12) pair model #SR-24447*J088, Universal Pan Slide, chrome plated (2 pieces required).

ITEM # 19 SPARE NUMBER

ITEM # 20 SPARE NUMBER:

ITEM # 21 INGREDIENT BINS: Provide three (3) Cambro model # IBS27148*J088, Ingredient Bin, mobile, 27 gallon capacity, one piece seamless polyethylene bin, two piece sliding polycarbonate lid, S-hook on front (scoop NOT included), four (4) three (3") inch heavy duty casters (two [2] front swivel, two [2] fixed), white with clear cover, NSF certified including.;

A. Three (3) Cambro model #SCP24CW135*J088, Camwear® Scoop, 24 oz., polycarbonate, clear, NSF certified.

ITEM # 22 BAKER'S TABLE: Provide one (1) Advance Tabco model #TKSS-3010*J088, Work Table, 120"W x 30"D, 14 gauge 304 stainless steel top with five (5") inch high backsplash, stainless steel legs with side and rear crossrails, adjustable stainless steel bullet feet, NSF certified including:

A. One (1) model #TA-61*J088, Modification to reduce length,,,116" LONG.
B. One (1) model #TA-22*J088, Square edge table.
C. One (1) model #TA-76*J088, Paint on sound deadening under top (supplements standard sound deadening under support channels).
D. One (1) model #TA-93*J088, Wall Clips, (for 5" and 10" splash only) (per table).
E. One (1) model #TA-100R*J088, Bullnose (3) sides of overshelf with rear up-turn or splash.
F. One (1) model #TA-23*J088, Table legs welded to leg gussets under table top and to undershelf or cross rails, shipped set up and crated(per table)
G. One (1) model #TA-95*J088, sixteen (16) gauge 304 stainless steel leg upgrade (per table).
H. One (1) model #TA-38*J088, Drawer Assembly, (3) tier, 20"W x 20"D x 5" deep removable stainless steel drawer inserts, roller bearing drawer slides, self closing drawers with noise control, concealed side panels, 430 stainless steel, all TIG welded and fully assembled, four (4) stainless steel legs with 1/2" adjustable hex feet (factory installation only),,RIGHT. One (1)12" wide.
I. One (1) model #TA- 227-3*J088, Splash mounting provision for 96" or longer.
J. One (1) model # PT-12S-120-TA99*J088, Overshelf, table mounted, single, 120"W x 12"D, stainless steel, uprights of shelf, splash mounted.
K. One (1) model #TA-60*J088, Special Length Modification to reduce size of shelf,,116" LONG, splash mounted.
L. One (1) model #AUR-120*J088, Utensil Rack, table mounted, adjustable, 120" long, stainless steel, includes: twelve (12) plated pot hooks.

ITEM # 23 DOUBLE CONVECTION OVEN: Provide two (2) Blodgett Manufacturing Company model #DFG-200 "Double" oven, including:

A. Six (6) racks per oven cavity.
B. Fan Delay / Pulse Plus
C. Stainless steel fronts, sides, tops and enclosed backs. Porcelain interiors.
D. Under hood flue diverter kit.
E. Electric continuous sounding buzzer with timers.
F. Doors to have dual pane thermal windows.
G. Casters with brakes.
H. Two (2) T&S Brass #HG-4D-48SK 48" flexible gas disconnect hoses to Plumber for installation. (One (1) hose per section.) DO NOT MANIFOLD OVENS.

ITEM # 24 WALL CAP: Provide two (2) Advance Tabco 16 gauge stainless steel size and shape as per plan, elevations, sections, details and general specifications, including:

A. #16 gauge stainless steel with two (2") inch turndown tight against walls and turned up straight on ends.

ITEM # 25 SPARE NUMBER

ITEM # 26 SPARE NUMBER

ITEM #27 TWO BURNER RANGE: Provide one (1) Garland, Master Sentry Series, model #MST4S-E range unit, including:

A. 17” heavy duty, natural gas, two (2) 35,000 BTU burners, spark ignition & flame fail on burners, stainless steel front and exposed ends.
B. 17” stainless steel back guard.
C. Rear gas connection including “Tee” in manifold with end cap and cover. ¾” gas pressure regulator..
D. Standard cabinet base mounted on stainless steel adjustable NSF legs.
E. Provide one (1) T&S Brass #HG-4D-48SK 48" flexible gas disconnect hoses to Plumber for installation.

ITEM # 28 HOT WATER DISPENSER: Provide one (1) Hatco model #AWD-12*J088, Atmospheric Hot Water Dispenser, countertop design, twelve (12) gallon capacity, automatic fill, pushbutton portion control, low water cut-off, electronic temp. control with digital display, stainless steel tank & base, cULus, UL EPH Classified, and ANSI/NSF 4 certified, Made in USA including;

A. Includes 24/7 parts and service assistance, call 800-558-0607.
B. 208v/60/1-ph, 5.0 kW.
C. Standard plug NEMA 6-30P.
D. One (1) each model #AWD-PLUMB*J088, three (3) foot rubber drain hose with 10 ft. 1/4" inlet tubing.
E. One (1) each model #AWD-FILTER*J088, Water filtration system with ten (10') feet of 1/4" tubing and fittings.

ITEM # 29 DOUBLE COMBI OVEN: Provide Model ICP 6-FULL/6-FULL comprised of two (2) (CC1GRRA.0000238 - NG - 208/240V) iCombi Pro® 6-Full Size Combi Ovens, double stack, natural gas, (12) 18" x 26" sheet pan or (24) 12" x 20" steam pan or (12) 2/1 GN pan capacity, (6) stainless steel grids included, intelligent cooking system with (4) assistants; iDensityControl, iCookingSuite, iProductionManager, & iCareSystem, (6) operating modes, (5) cooking methods, (3) manual operating modes, 85° to 572°F temperature range, quick clean, care control, eco mode, 6-point core temperature probe, retractable hand shower, Ethernet interface, Wi-Fi enabled, includes: (2) buckets of Active Green Cleaner, & (2) buckets of Care Tabs, 106,500 BTU each, 208/240v/60/1-ph, 0.9 kW each, IPX5, cCSAus, NSF, ENERGY STAR®, each including:

A. 1 kit Model 60.75.752 Combi-Duo Stacking Kit for iCombi 6-half size or 6-full size (electric or gas) on iCombi 6-full size (gas only)
B. 1 each Model 60.31.204 Stand I for Combi-Duo, mobile, 7-3/4"H, all sides open, stainless steel construction, height adjustable casters, for iCombi 6-full size on 6-full size
C. 1 each Model 87.00.732US Safety-Set, Equipment placement system for all casters-mounted equipment, allows precise, consistent equipment placement for drain lines to floor sinks and under the fire suppression in ventilation systems, satisfies NFPA codes 17A (5.6.4) and 96 (12.1.2.3), includes tow (2) pieces and installation pack. THIS ITEM IS NON_DISCOUNTABLE (NET) 1 ea
D. NOTE: All discounts subject to approval by manufacturer
E. 1 each 2 years parts and labor, 5 years steam generator warranty
F. 1 each Model CAP Chef Assistance Program, a RATIONAL certified Chef conducts 4 hours/location specialized application training with personnel, no charge
G. 2 each Model 8720.1560US Installation Kit, for gas iCombi/SCC/CMP 101G (120/60/1ph); gas iCombi/SCC/CMP 62G (208-240/60/1ph); gas iCombi/SCC/CMP 61G (120/60/1ph) THIS ITEM IS NON-DISCOUNTABLE, USA ONLY (NET)
H. 1 each Model 1900.1150US Water Filtration Double Cartridge System, for Combi-Duo models 62/62 or 62/102 or if used for more than (2) units, includes: (1) double head with pressure gauge, (2) R95H filter & (1) filter installation kit (for each

additional unit add (1) additional head & additional cartridge. Maximum (4) cartridges)

I. 1 each Model 9999.2271 RCI RATIONAL Certified Installation, additional installation cost for a RATIONAL Water Filter System is available when purchased with Certified Installation of RATIONAL unit THIS ITEM IS NON-DISCOUNTABLE, USA ONLY (NET)

J. 1 each NOTE: The RATIONAL Water Filtration Systems helps provide consistent high quality water to your RATIONAL cooking systems. The patented carbon block technology reduces the effects of sediment, chloramines and chlorine while providing the required flow rates

K. 6 each Model 6010.2101 Additional Gastronorm Grid Shelf, 2/1 size, 25-5/8" x 20-7/8", stainless steel Specifications 10/20/2021 Page 1 of 2

L. 4 each Model 60.71.617 Grilling & Searing Plate, 1/1 size, 12-3/4" x 20-7/8" (the continuous lip at the back makes it ideal for roasting food that is likely to give off fat or liquid, coated with TriLax coating) 4 ea Model 60.70.943 Grill & Pizza Tray, 1/1 GN, 12" x 20", TriLax® coating, pre-heat pan prior to food placement

M. 4 each Model 6035.1017 Gastronorm CombiGrill, 1/1 GN, 12-3/4" x 20-7/8", TriLax® coating

N. 6 each Model 6019.1150 Free for K-12 Projects: CombiFry Basket, 1/1 GN, 12-3/4" x 20-7/8"

ITEM # 30 EXHAUST HOOD w/ FIRE PROTECTION: Provide one (1) Avtec model #EA2-PBB*J088, ventilator, each including:

A. Sizes and shapes as per plan, elevations, sections and details. Entire unit shall be constructed of 18 gauge 304 stainless steel with a No. 4 finish having a three inch rear air space. Top of the canopy to be constructed to incorporate the exclusive Avtec aerodynamic arch. Unit is constructed using the standing seam method for optimum strength. All external seams and joints to be welded and liquid tight, all exposed welds to be ground and polished. Continuous capture areas without transverse interior partitions. Double walled stainless steel end panels.

B. Connecting ductwork above ceiling to be by the Mechanical Contractor to connection collars of the stainless steel exhaust plenums and supply air plenums built into ventilators. Final connection to ducts to be made in an approved manner by the HVAC Contractor. Ventilators to have adjustable make up air damper which must remain accessible for adjustment.

C. Grease extraction is accomplished by way of a front located high velocity exhaust slot running the full length at the top of the hood trough grease filters with full length concealed grease trough pitched to a removable grease cup. Grease filters are removable though exhaust plenum access doors. Provide #18 gauge stainless steel (Type #304) filter rack with model 1616L low volume filter modules. Return air to be model PBB, make-up air plenum running full length of hood. Return air to be model PBB, make-up air plenums running full length of hood incorporating outside and conditioned air.

D. Finished backs where exposed and horizontal trim between hoods where applicable. #18 gauge stainless steel (Type #304) filler panels to ceiling wherever required.

E. UL listed LED type lights (with bulbs by Kitchen Equipment Supplier), pre-wired to final connection point (junction box) on top of hood. See Electrical Requirements Plan for quantity of lights.

F. 1/2" diameter steel hanger rods attached to factory, pre-drilled hanger brackets to be by Kitchen Equipment Supplier, but they are to be anchored to supporting structure (or slab) by the General Contractor in the locations required by shop details.

G. Provide U.L. approved Ansul or approved equal wet chemical hood and duct fire extinguishing system in hood with one (1) year warranty on the cylinder and hardware. Provide nozzles where required for surface protection of equipment and entire system to be in compliance with NFPA pamphlet #96, U.L. Standard #300 and local governing code authorities.
H. Provide one (1) type “K” hand extinguisher mounting bracket, or equal, located per plan to meet code.
I. A manual fire pull station shall be included by the fire protection installer and installed by Electrician, per coordination, and with the approval from local governing code authorities in the path of egress. The fire pull station location is to be coordinated by the Kitchen Equipment Supplier and inter-wiring shall be done by the Electrician. All exposed fire control piping to be chrome plated and all hood penetrations are to be sealed with U.L. listed stainless steel penetration fittings. Provide fire dampers in supply air collars and fire blanket if required by local code.
J. Provide one (1) per hood section ASTS-90 heat sensor per IMC 2006.
K. Provide #18 gauge stainless steel (Type #304) filler panels to ceiling wherever required.
L. One year parts and labor warranty.
M. Manufacturer to check out system after installation to verify actual exhaust and supply air quantities and certify that performance is as designed and provide written report.

ITEM # 31 WORK TABLE w/ UTENSIL RACK: Provide one (1) Advance Tabco model #SS-4811*J088, Work Table, 132"W x 48"D, 14 gauge 304 stainless steel top, 18 gauge adjustable stainless steel undershelf, stainless steel legs and adjustable bullet feet, NSF certified, including:

A. One (1) model #TA-22*J088, Square edge table.
B. One (1) model #TA-76*J088, Paint on sound deadening under top (supplements standard sound deadening under support channels).
C. Nine (9) model #TA-19*J088, Flanged Bullet Foot Insert, stainless steel (per foot) (fully collapsed it is 1-1/2” tall).
D. One (1) model #TA-23*J088, Welded Set Up Table/Shell Crating (per table).
E. Eleven (11) feet Model #TA-94*J088, 16 gauge 304 stainless steel undershelf upgrade (per linear foot).
F. One (1) model #TA-95*J088, 16 gauge 304 stainless steel leg upgrade (per table).
G. Two (2) model #SHD-2020*J088, Drawer, 20"W x 20"D x 5" deep drawer pan insert, heavy duty, self-closing, stainless steel, Mid mount, NSF certified.
H. One (1) model #TA-228-3*J088, Mid mounting provision for 96" or longer table.
I. One (1) model #SCT-132*J088, Pot Rack, table mounted, circular design, 132" long, stainless steel, includes: eighteen (18) plated pot hooks and one (1) AUR-132 utensil rack.
J. Four (4) model TA-62C*J088, dual receptacle outlet.

ITEM # 32 EXHAUST HOOD w/ FIRE PROTECTION: Provide one (1) Avtec model #EA2-PBB*J088, ventilator, each including:

A. Sizes and shapes as per plan, elevations, sections and details. Entire unit shall be constructed of 18 gauge 304 stainless steel with a No. 4 finish having a three inch rear air space. Top of the canopy to be constructed to incorporate the exclusive Avtec aerodynamic arch. Unit is constructed using the standing seam method for optimum strength. All external seams and joints to be welded and liquid tight, all exposed welds to be ground and polished. Continuous capture areas without transverse interior partitions. Double walled stainless steel end panels.

B. Connecting ductwork above ceiling to be by the Mechanical Contractor to connection collars of the stainless steel exhaust plenums and supply air plenums built into ventilators. Final connection to ducts to be made in an approved manner by the HVAC Contractor. Ventilators to have adjustable make up air damper which must remain accessible for adjustment.
C. Grease extraction is accomplished by way of a front located high velocity exhaust slot running the full length at the top of the hood trough grease filters with full length concealed grease trough pitched to a removable grease cup. Grease filters are removable though exhaust plenum access doors. Provide #18 gauge stainless steel (Type #304) filter rack with model 1616L low volume filter modules. Return air to be model PBB, make-up air plenum running full length of hood. Return air to be model PBB, make-up air plenums running full length of hood incorporating outside and conditioned air.
D. Finished backs where exposed and horizontal trim between hoods where applicable. #18 gauge stainless steel (Type #304) filler panels to ceiling wherever required.
E. UL listed LED type lights (with bulbs by Kitchen Equipment Supplier), pre-wired to final connection point (junction box) on top of hood. See Electrical Requirements Plan for quantity of lights.
F. 1/2" diameter steel hanger rods attached to factory, pre-drilled hanger brackets to be by Kitchen Equipment Supplier, but they are to be anchored to supporting structure (or slab) by the General Contractor in the locations required by shop details.
G. Provide U.L. approved Ansul or approved equal wet chemical hood and duct fire extinguishing system in hood with one (1) year warranty on the cylinder and hardware. Provide nozzles where required for surface protection of equipment and entire system to be in compliance with NFPA pamphlet #96, U.L. Standard #300 and local governing code authorities.
H. Provide one (1) type “K” hand extinguisher mounting bracket, or equal, located per plan to meet code.
I. A manual fire pull station shall be included by the fire protection installer and installed by Electrician, per coordination, and with the approval from local governing code authorities in the path of egress. The fire pull station location is to be coordinated by the Kitchen Equipment Supplier and inter-wiring shall be done by the Electrician. All exposed fire control piping to be chrome plated and all hood penetrations are to be sealed with U.L. listed stainless steel penetration fittings. Provide fire dampers in supply air collars and fire blanket if required by local code.
J. Provide one (1) per hood section ASTS-90 heat sensor per IMC 2006.
K. Provide #18 gauge stainless steel (Type #304) filler panels to ceiling wherever required.
L. One year parts and labor warranty.
M. Manufacturer to check out system after installation to verify actual exhaust and supply air quantities and certify that performance is as designed and provide written report.

ITEM # 33 <u>30 GALLON TILT BRAISING PAN</u>: Provide one (1) Groen Model #BPM-30GC*J088, Braising Pan, gas, 30-gallon capacity, 10" deep pan, 38" pan height, IPX6 water rated electronic Classic controls, manual tilt, standard etch marks, faucet bracket, round tubular open leg base, stainless steel construction, bullet feet, electric spark ignition, 104,000 BTU/hour, cCSAus, and NSF certified, Made in USA including:

A. Two year parts and labor warranty (K-12 School purchases only).
B. Natural gas fired.

C. One (1) model #ELEV0-2000*J088, For elevation between 0 and 2000 (When order is placed, all equipment with elevation specified will be assigned a different Part# by the factory).
D. 120v/60/1-ph, 5.0 amps, standard.
E. One (1) model #Z079995*J088, Lip Strainer, for tilting braising pans.
F. One (1) T&S Brass #HG-4C-48SK 48" flexible gas disconnect hoses to Plumber for installation.
G. One (1) optional double pantry water fill faucet with mounting bracket.

ITEM # 34 ANTISPLASH FLOOR TROUGH: Provide one (1) IMC Teddy model # ASFT-2136*J088, Floor Trough, including:

A. Anti-spill design, size and shape per plan constructed of #14 gauge 18-8 type #304 stainless steel, fully welded, coved-corner construction.
B. Trough will be fitted with stainless steel waste cup with removable basket for 3½" waste pipe.
C. Provide Manchester Associates model #FRP, cut to size and shape as per plan, (sections not to exceed 18" in length), 1-1/2 square mesh grating, stainless steel grate color. Contact information Mr. Steve Manchester, 214-357-3978. Chemgrate heavy duty model FS series removable grates are an acceptable alternate.
D. To be provided by KEC., installed by G.C. KEC to verify and coordinate with site conditions and general contractor. Verify with the pour path and placements of Item #33, 30 GALLON TILT BRAISING PAN. All troughs are to be flush with finished floor, reference details on drawings for installation.
E. A specific product manufactured by the following listed manufacturer is acceptable only if the specific product can evidence compliance with the specified Item and the Contract Documents: Kelley Products, BSI or Advance Tabco.

ITEM # 35 WALK-IN COOLER/FREEZER: Provide one (1), two (2) compartment pre fabricated Thermokool factory installed complete working assembly, including:

A. Special sized, 4" thick sections assembled as indicated on drawings, 8' 6" high above finished floor. Corner and "T" panels shall be matching one-piece construction including 1/2" minimum radius at all inside vertical corners. Assemble using standard cam fasteners and sealed with PVC double bubble gasket at interior and exterior of panel edges.
   1. Interior face of wall panels shall be clad with 0.040" smooth white finish.
   2. Interior face of ceiling panels shall be clad with 0.040" smooth white finish.
   3. Exterior exposed face of wall panels shall be clad with #20 gauge stainless steel with 1/8" aluminum treadplate to 48" above finished floor per plan. In addition, provide and install stainless steel bumper on exterior per plan above aluminum tread plate.
   4. Exterior unexposed face of panels shall be clad with 0.40" smooth aluminum finish.
   5. Trim to walls and ceiling where required, with same material as exposed exterior, using hidden fasteners per detail on drawings. Pop rivets will not be accepted.
B. Doors shall be 36" x 80" high with heated triple pane view ports. Exterior to match exterior finish and interior to match interior finish. Metal joints to be welded, ground, and polished. Interior and exterior jamb guards of 1/8" aluminum tread plate 48" high. Interior and exterior kickplates of 1/8" tread plate 48" high. Cooler and Freezer doors to be provided with 120 volt dedicated circuit heater cable around parameter including heated threshold. Provide three (3) chrome-plated hinges, (one spring loaded) latch with interior safety release and cylinder lock. Doors to have Kason model #1094 (or equal) heavy duty door closers. Provide Berner Artic swinging door assembly on both cooler and freezer door.

C. Walk-in compartments to be less floors with walls to be installed in recessed pit as shown on plans and details. Kitchen Equipment Contractor to furnish insulation and vapor barrier film to Floor Contractor for installation. Finished floor and waterproofing to be by General Contractor. When coved base comprised of the specified flooring material is not provided, K.E.C. shall provide and install New Age aluminum coved base at all interior and exterior walls where they meet the finished floor. All coved base is to be installed with approved mastic and all sealed to all adjacent surfaces with clear silicone.

D. Provide Kason, model 1809 L.E.D. vapor proof lights with bulbs located in each compartment (See Electrical Requirements Plan for quantity). Provide two (2) factory installed Modularm model #75LC multi-monitors located as per drawings mounted at 54" A.F.F. on the strike side of each door complete with model IP-1 timed lighting and panic alarm control modules with illuminated push buttons mounted at 48" A.F.F. on the strike side of the door on the interior of each compartment with flush mounted dial thermometers above the Modularm modules for back-up. Also provide model MD-1 motion detectors at 88" A.F.F. above the door on the interior of each compartment to automate light control functions. All conduit is to be imbedded in vault walls and/or ceiling panels. Exposed conduit will NOT be accepted. Extend conduit to J-Box located on top of ceiling.
   1. Factory mount in head section, electrically heated vacuum pressure relief vent, dedicated circuit. Kason model #1832 (or approved equal) flush mounted. Mount away from direct air stream of coil.
   2. Furnish sufficient quantity of 3/8" and/or ½" diameter nylon threaded rods with stainless steel nuts and washers to support refrigeration coils.
   3. Furnish sufficient quantity of 5 inch diameter stainless steel escutcheon plates to dress off utility penetrations by other trades.
   4. Five (5") inch Dial thermometers, flush mounted or two (2) flush mounted factory installed Modularm model #75B monitors complete with battery back-up mounted at fifty-four (54") inches above finished floor. (one for each compartment) Manufacturer to furnish fixtures preassembled with wiring for installation by Electrical Contractor. All conduit to be concealed in the wall panel. Extend conduit to J-Box located on top of ceiling.

E. PVC plastic conduit between interior and exterior of vaults. Pre wire door defrosters to top of Cooler/Freezer vaults for final connection by the Electrician.

F. Delivery and erection of assembly shall be preformed by a Factory approved and supplied installer ONLY. Kitchen Equipment Contractor must submit a list to the Foodservice Consultant of qualified installers for approval by the owner previous to installation of vaults. Manufacturer to check the finished work of the Electrician and Refrigeration Installer, in particular the vault wall penetration and sealing of light fixtures.

G. Provide one (1) year free service including parts, labor and a minimum of ten (10) year warranty on walk in panels.

ITEM # 36 <u>WALK-IN FREEZER SHELVING</u>: Provide one (1) LOT Cambro Camshelving Premium shelving, including:

A. 84"H stationary posts. Shelving sections sized per unit.
B. Five (5) tiers of shelves with vented shelf mats per shelving section
C. One (1) Camshelving Premium dunnage support, 7-1/2" high per shelving section
D. Vertial posts and horizontal traverses are made of a steel core coated with a smooth polypropylene exterior. Reinforced nylon foot on bottom of each stationary post adjusts easily for floor irregularities.
E. Post connectors and shelves up to 48" long hold up to 800 lbs. evenly distributed static weight. Shelves 54" - 72" long hold up to 600 lbs. each.

F. Molded in dovetails on posts ensure that traverses set easily into place. Shelves and traverses can be adjusted at 4" increments. The shelf traverses can be easily removed and washed in a conveyor dishwasher.
G. Works in temperatures -36˚F to 190˚F. All components are weldless, rust free with no exposed metal. Lifetime warranty against rust and corrosion.
H. Shelf plates are removable and can contain Camguard an antimicrobial technology incorporated throughout the shelf plate material, that will never wash off or wear out, and inhibits the growth of mold, fungus and bacteria.
I. Assembles with the use of a rubber mallet, requiring no bolts or nuts, clips or stainless-steel connectors.

ITEM # 37 WALK-IN FREEZER EVAPORATOR: Specification for freezer evaporator included in ITEM # 1 REMOTE REFRIGERATION RACK

ITEM # 38 MOBILE PAN RACK: Provide eight (8) New Age model #1335*J088, Roll-In Refrigerator/Proofer Rack, universal, open frame design, sixty-four (64") high, wide angle slides for eighteen (18) 18" x 26" pans, slides on approximately three (3") inch centers, all welded aluminum construction, end loading, four (4) five (5) inch" platform casters, two (2) swivel, and two (2) swivel with brakes, NSF certified, Made in USA including;

A. Lifetime warranty against rust and corrosion, five (5) year construction warranty, standard.
B. Model #PS*J088, Pan Stop, aluminum strap welded to rear of unit (MUST BE FACTORY INSTALLED).
C. Model #B*J088, Corner Bumpers, non-marking gray rubber, set of four (4) (available on full frame units only).

ITEM # 39 SPARE NUMBER

ITEM # 40 WALK-IN COOLER EVAPORATOR: Specification for cooler evaporator included in ITEM # 1 REMOTE REFRIGERATION RACK

ITEM # 41 WALK-IN COOLER SHELVING: Provide one (1) LOT Cambro Camshelving Premium shelving, including:

A. 84”H stationary posts. Shelving sections sized per unit
B. Five (5) tiers of shelves with vented shelf mats per shelving section
C. One (1) Camshelving Premium dunnage support, 7-1/2” high per shelving section
D. Vertial posts and horizontal traverses are made of a steel core coated with a smooth polypropylene exterior. Reinforced nylon foot on bottom of each stationary post adjusts easily for floor irregularities.
E. Post connectors and shelves up to 48" long hold up to 800 lbs. evenly distributed static weight. Shelves 54" - 72" long hold up to 600 lbs. each.
F. Molded in dovetails on posts ensure that traverses set easily into place. Shelves and traverses can be adjusted at 4" increments. The shelf traverses can be easily removed and washed in a conveyor dishwasher.
G. Works in temperatures -36˚F to 190˚F. All components are weldless, rust free with no exposed metal. Lifetime warranty against rust and corrosion.
H. Shelf plates are removable and can contain Camguard an antimicrobial technology incorporated throughout the shelf plate material, that will never wash off or wear out, and inhibits the growth of mold, fungus and bacteria.
I. Assembles with the use of a rubber mallet, requiring no bolts or nuts, clips or stainless-steel connectors.

ITEM # 42 HAND WASH SINK: Provide one (1) Advance Tabco model # 7-PS-50*J088, Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 stainless steel, with splash mounted faucet, lever drain with overflow, P-trap, wall bracket, NSF, and cCSAus certified.

B. 12” high, welded end splash where indicated on plan.

ITEM # 43 POWERSOAK PRODUCE WASH SINK: Provide one (1) Powersoak model #50PSP84L48B1*J088, Power Soak – Produce soak four bay system including:

A. Unit shall be 9’-8” O. D. left to right operation by 30” front to back.
B. One and one-half (1-1/2”) inch front channel rim.
C. Back splash to be eight (8”) inch over all height (six (6”) inch vertiacl with forty-five degree angle to wall with one (1”) inch turn up. Back slash to run the full length of back of unit.
D. 3’-4” soiled drainboard with hemmed end splash.
E. 3’-4” clean drainboard wit hemmed end splash.
F. Wash tank shall be thirty-six (36”) inch left to right by twentyfour and three-quarter inside dimension front to back by nineteen (19”) inches deep.
G. All tanks to be constructed of fourteen (14) gauge 304 stainless steel.
H. System conforms to ANSI/NSF Standard two (2) with all welds to be Heliarc (TIG) welds.
I. One (1) component Hardware model #DBN-9100-PS*J088, reea exit ball valve drains and one (1) T&S Brass one-half (1-1/2”) inch pre-rinse faucet with one (1) one-half (1-1/2”) inch Add on faucet assembly.
J. Wash Tank:
    1. Parallel wash flow with twelve (12) low profile wash jets, Each bay to have three (3) low profile wash jets, side by side, flush against back wall of wash tank separated by by three (3”) inches to next set of of low profile wash jets,in adjoining wash bay above wash pump intake.
    2. Stainless steel wash pump intake to run full lenghth of the back wall of the wash tank, below the the wash jets.
    3. Stainless steel wash pumphousing fully self draining with no use on drainline or valve.
    4. Bottom of wash tank to be creased to facillitate draining.
    5. Three-quarter (3/4 hp) horsepower heavy duty (TEFC) washpump motor with stainless steel impeller, pump housing and wash manifold.
    6. One (1) three-quarter (3/4”) inch stainless steel tube integrally welded through back splash for chemcal injection.
    7. Wash Tank to have three (3) Ultra-High Molecular Weight Polyethylene (UHMW) Tank Dividers, four (4) (UHMW) Wash Tank Bay Flow Guides, one (1) High Density Polyethylene (HDPE) Rib-Systemintegrallyconnected with stainless steel rods.
    8. Two (2) stainless steel removable self loading produce baskets for un-loading.
K. PS-50 Control; Pistol Grip ON/OFF Mechanical Start/ Stop Switch
L. Three(3) year parts and three (3) year labor warrantyfrom the date of shipping.
M. One (1) year warranty on four (4) Ultra-High Molecular Weight Polyethylene (UHMW) Wash Tank Bay Flow Guides.

ITEM # 44 3 COMPARTMENT SINK: Provide one (1) Advance Tabco model # K7-3-2430-24RL-14*J088, Super Size Fabricated Sink, three (3) compartment, with left and right-hand drainboards, thirty (30") inches front-to-back x twenty-four (24") inch wide sink compartment, fourteen (14") inch deep, with tile edge splash, full skirt, stainless steel bullet feet, fourteen (14) gauge 300 series stainless steel, twenty-four (24") inch

drainboards, overall Thirty-six (36") inches front to back by one hundred and eighty (180") inches left to right, including;

A. Three (3) model #K-476*J088, Punch hole for overflow drain, one 1) punch required for each overflow drain; three (3) model #K-15*J088, Lever Waste Drain, twist handle operated with built in overflow, fits 3-1/2" drain opening, 2" NPT and 1-1/2" IPS outlet connections , and three (3) #K-4*J088, Support Bracket, for lever waste drain handle, (1) support required for each lever drain.
B. Model #K-450*J088, Extra Drainboard, (per linear foot), sixty (60") inch RIGHT DRAIN BOARD.
C. One (1) each model #K-495*J088, Turn Down Backsplash (includes wall clips).
D. Sixteen (16') feet, model #K-448*J088, High backsplash, up to thrrteen (13") inches, (per linear foot),, twelve (12") inch high backsplash.
E. One (1) each model #K-57*J088, Welded field joint (welded and finished in field by installers.)
F. One (1) each model #K-76*J088, Paint-on sound deadening under top (each).
G. Two (2") feet model # K-479*J088, Undershelf, stainless steel, (per linear foot),,LEFT END.
H. Two (2") feet model #TA-94*J088, sixteen (16) gauge 304 stainless steel undershelf upgrade (per linear foot).
I. One (1) model #K-23*J088, Welded set-up and shell crated (per sink).
J. One (1) model #DTA-95*J088, Installation, scrapper top (300SM *J088, top by others),LEFT END sink mounted.
K. Sixteen (16') feet model #K-480*J088, Shelf, twelve (12") inches wide, stainless steel.
L. Sixteen (16') feet model # K-499*J088, Pot Rack, stainless steel, includes: twenty (20) plated pot hooks.

ITEM # 45 SCRAPMASTER: Provide one (1) Salvajor model #300-SM*J088, ScrapMaster, scrapping, pre-flushing and disposing system with water recirculation, three (3) HP disposer, salvage basin and silverware trap, stainless steel construction, with NEMA 4 HYDROLOGIC® control panel with patented operator sensor, water saving mode, safety line disconnect and LCD readout, UL, CSA, CE, and NSF.

ITEM # 46 DRYING RACK: Provide one (1) Cambro Camshelving Premium shelving, including:

A. Eighty-four (84") inch high stationary posts
B. Two (2) tiers of shelves with vented shelf mats per shelving section
C. Two (2) tiers angled drying racks, eight (8) slot each.
D. One (1) tier vertical drying rack, seven (7) slots each.
E. One (1) Camshelving Premium dunnage support, 7-1/2" high per shelving section
F. Vertical posts and horizontal traverses are made of a steel core coated with a smooth polypropylene exterior. Reinforced nylon foot on bottom of each stationary post adjusts easily for floor irregularities.
G. Post connectors and shelves up to 48" long hold up to 800 lbs. evenly distributed static weight. Shelves 54" - 72" long hold up to 600 lbs. each.
H. Molded in dovetails on posts ensure that traverses set easily into place. Shelves and traverses can be adjusted at four (4") inch increments. The shelf traverses can be easily removed and washed in a conveyor dishwasher.
I. Works in temperatures -36˚F to 190˚F. All components are weldless, rust free with no exposed metal. Lifetime warranty against rust and corrosion.
J. Shelf plates are removable and can contain Camguard an antimicrobial technology incorporated throughout the shelf plate material, that will never wash off or wear out, and inhibits the growth of mold, fungus and bacteria.

K. Assembles with the use of a rubber mallet, requiring no bolts or nuts, clips or stainless-steel connectors.

ITEM # 47 SOILED DISH RACK: Provide one (1) Cambro Camshelving Premium shelving, including:

A. 72”H stationary posts. Shelving units sized per drawings.
B. Four (4) tiers of shelves with solid shelf mats per shelving section
C. One (1) Camshelving Premium dunnage support, 7-1/2” high per shelving section
D. Vertial posts and horizontal traverses are made of a steel core coated with a smooth polypropylene exterior. Reinforced nylon foot on bottom of each stationary post adjusts easily for floor irregularities.
E. Post connectors and shelves up to 48" long hold up to 800 lbs. evenly distributed static weight. Shelves 54" - 72" long hold up to 600 lbs. each.
F. Molded in dovetails on posts ensure that traverses set easily into place. Shelves and traverses can be adjusted at 4" increments. The shelf traverses can be easily removed and washed in a conveyor dishwasher.
G. Works in temperatures -36˚F to 190˚F. All components are weldless, rust free with no exposed metal. Lifetime warranty against rust and corrosion.
H. Shelf plates are removable and can contain Camguard an antimicrobial technology incorporated throughout the shelf plate material, that will never wash off or wear out, and inhibits the growth of mold, fungus and bacteria.
I. Assembles with the use of a rubber mallet, requiring no bolts or nuts, clips or stainless-steel connectors.

ITEM # 48 2-DOOR PASS - THRU REFRIGERATOR: Provide two (2) Utility Refrigerator model # PT-R-60-SS-4G-4G-D*J088 Pass-Thru Refrigerators, two-section, stainless steel exterior and interior, standard depth, half-height glass doors, interior LED lights, non-proprietary controls, self-contained refrigeration system featuring receiver tank, low-pressure burnout protection, threaded filter dryer, sight glass, and high and low side service ports, 6" adjustable stainless steel legs, and NSF certified, including:

A. 115 volt, 1 phase, with cord and plug, NEMA 5-15P, standard.
B. Five (5) year service/labor, five (5) year compressor warranty, standard.
C. Kitchen Side: Door hinging per Foodservice Equipment Layout Plan (QF101).
D. Serving Side: Door hinging per Foodservice Equipment Layout Plan (QF 101).
E. Fourteen (14) sets of universal tray slides for 18” X 26” pans and/or 12” X 20” pans on three (3”) inch spacing, per section.
F. LED lights with exterior switch.

ITEM # 49 PASS-THRU HEATED CABINET: Provide two (2) Utility Hot Food Cabinet, model #PT-HC-30-SS-2G-2G-D including:

A. Stainless steel exterior and interior.
B. Half size doors with glass on both kitchen and service side. Hinging to be per plan.
C. Controls on kitchen side; interior light with LED lighting.
D. Locking hardware.
E. Twelve (12) sets of universal pan files on 4" centers in top and bottom sections for 18" x 26" pans and 12" x 20" pans. Omit standard shelves.
F. Provide mounted on stainless steel adjustable legs.
G. Full height, 12” high top mount stainless steel shroud.
H. Three year parts and one year labor warranty.

ITEM # 50 ICE MACHINE w/ BIN: Provide one (1) Manitowoc model #IYT0450A*J088, Indigo NXT™ Series Ice Maker, cube-style, air-cooled, self-contained condenser, 30"W x 24"D x 21-1/2"H, production capacity up to 490 lb/24 hours at 70°/50° (378 lb AHRI certified at 90°/70°), DuraTech™ exterior, half-dice size cubes, R410A refrigerant, NSF, cULus, CE, and ENERGY STAR® certified, including;

A. One (1) model #WARRANTY-ICE-SC*J088, three (3) year parts and labor (Machine), five (5) year parts and labor (Evaporator), five (5) year parts and three (3) years labor (Compressor), standard.
B. One (1) model # (-161*J088) 115v/60/1-ph,, 11.9 amps.
C. One (1) model #X*J088, Factory Built-In LuminIce II Growth Inhibitor, comes pre-installed in ice machine (Add "X" to end of Indigo model number).
D. One (1) model #WARRANTY-LUMINICE*J088, three (3) year parts and labor warranty, standard.
E. One (1) model #D400*J088, Ice Bin, 30"W x 34"D x 38"H, with side-hinged front-opening door, side grips, AHRI certified 365 lb ice storage capacity (12.3 cu. ft.), for top-mounted ice maker, Duratech exterior, NSF certified.
F. One (1) model #WARRANTY-BIN/DISP*J088, three (3) year parts and labor warranty, standard.
G. One (1) model # K00461*J088, External Scoop Holder, wall or bin mount, metal frame with plastic shield, NSF certified.
H. Legs, six (6") inches adjustable stainless steel, standard.
I. One (1) Everpure model #EV932401*J088, Insurice Single-i2000² System, 9,000 gallon capacity, 1.67 gpm flow rate, 0.5-micron precoat filtration, (1) I2000² cartridge, with self-contained scale inhibitor feed, for cubers up to 500 lbs/day or flakers up to 1,500 lbs/day, pressure gauge, flushing valve, NSF, and ANSI certified.
J. Six (6) Everpure model #EV961222*J088, Everpure® I2000² Replacement Cartridge, 9,000 gallon capacity, chlorine taste and odor reduction, scale inhibitor, 35-100° F temperature, 1.67gpm flow rate, 0.5-micron rating, 10-125 PSI non-shock required, ANSI, and NSF certified.

ITEM # 51 FLOOR TROUGH w/ GRATE: Provide one (1) Advance Tabco model #FTG-1836*J088, Floor Trough, 36"W x 18"D x 4" deep, 14 gauge 304 stainless steel, includes stainless steel subway grating constructed from 3/16" x 1" bars, removable stainless steel strainer basket, 4" O.D. waste pipe 3"L, pitched towards waste, NSF certified, including;

A. One (1) model #FT-6*J088, Modify length of trough (start with next larger size), 33" LONG
B. One (1) model #FT-3*J088, Modify trough depth (2” minimum to 6” maximum, 4” is standard) (per linear foot) (must match length of trough, for odd lengths use next larger foot increment) (sold per linear foot),,2" DEEP.

ITEM # 52 HAND WASH SINK: Provide one (1) Advance Tabco model # 7-PS-50*J088, Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 stainless steel, with splash mounted faucet, lever drain with overflow, P-trap, wall bracket, NSF, and cCSAus certified.

A. 12” high, welded end splash where indicated on plan.

ITEM # 53 FOOD PROCESSOR: Provide one (1) Robot Coupe model # R602VV*J088 Combination Food Processor, seven (7) liter stainless steel bowl with handle, continuous feed kit with kidney shaped and cylindrical shaped hoppers, includes: one(1) each "S"

blade, one (1) each 3mm grating disc (28058), one (1) each 3mm slicing disc (28064), two speeds, 850 and 1750 RPM, cETLus, ETL-Sanitation including;

A. One (1) year parts and labor warranty.
B. One (1) set model #LP5DISC*J088, LP5Disc, (5) disc package includes: (1) 3/16" grating disc, (1) 1/4" x 1/4" julienne disc, (1) 3/16" slicing disc and (1) 3/8" x 3/8" dicing kit (contains two discs).
C. One (1) model #R199*J088, Robo-Cart Equipment Stand, 18-9/16"W x 34-1/8"D x 38-1/2"H, adjustable handle, adjustable aluminum cantilever shelf (adjusts from 10-3/16" to 27-1/2"H), stainless steel insert shelving with ten (10) cutting disc slots, includes one (1) 5/32" Allen wrench for assembly/disassembly, five (5") inch heavy duty swivel casters (200 lb capacity), heavy duty aluminum construction (plates not included).

ITEM # 54 WORK TABLE w/ PASS WINDOW: Provide one (1) Advance Tabco model # SS-245*J088, Work Table, 60"W x 24"D, 14 gauge 304 stainless steel top, 18 gauge adjustable stainless steel undershelf, stainless steel legs and adjustable bullet feet, NSF certified, including;

A. One (1) model #TA-61*J088, Modification to reduce length,,,54" LONG.
B. Five (5) feet model #FAB-X*J088, Partial back splash, eight (8") inches high (per linear foot).
C. One (1) model #TA-22*J088, Square edge table.
D. One (1) model #TA-76*J088, Paint on sound deadening under top (supplements standard sound deadening under support channels) (each).
E. Two (2) ft. model #TA-84*J088, Simple pass-thru, (per linear foot).
F. Print Required prior to fabrication.
G. Field dimensions of wall thickness,wall height, and depth required prior to fabrication.
H. One (1) model #TA-84F-36*J088, Pass-Thru Window Frame, 36" (must order TA-84 as an option to a work table and length must match TA-84).
I. One (1) model #TA-23*J088, Welded Set Up Table/Shell Crating (per table).
J. Five (5”) ft, Model # TA-94*J088, sixteen (16) gauge 304 stainless steel undershelf upgrade (per linear foot).
K. One (1) model #TA-95*J088, sixteen (16) gauge 304 stainless steel leg upgrade (per table).
L. One (1) model #TA-57*J088, Welded field joint (welded in field by dealer installers).
M. THIS ITEM WILL BE WELDED TO ITEM 54A IN FIELD. PRINT APPROVAL REQUIRED

ITEM # 54A WORK TABLE w/ PASS WINDOW: Provide one (1) Advance Tabco model #SS-245*J088, Work Table, 60"W x 24"D, 14 gauge 304 stainless steel top, 18 gauge adjustable stainless steel undershelf, stainless steel legs and adjustable bullet feet, NSF certified, including;

A. One (1) model #TA-61*J088, Modification to reduce length,,,54" LONG.
B. Five (5) feet model #FAB-X*J088, Partial back splash, eight (8") inches high (per linear foot).
C. One (1) model #FAB-X*J088, NOTCH SPLASH FOR FIELD WELD.
D. One (1) model #TA-22*J088, Square edge table.
E. One (1) model #TA-76*J088, Paint on sound deadening under top (supplements standard sound deadening under support channels) (each).
F. One (1) model #TA-23*J088, Welded Set Up Table/Shell Crating (per table).
G. Five (5”) ft, Model # TA-94*J088, sixteen (16) gauge 304 stainless steel undershelf upgrade (per linear foot).

H. One (1) model #TA-95*J088, sixteen (16) gauge 304 stainless steel leg upgrade (per table).
I. One (1) model #TA-57*J088, Welded field joint (welded in field by dealer installers).
J. THIS ITEM WILL BE WELDED TO ITEM 54 IN FIELD. PRINT APPROVAL REQUIRED.

ITEM # 55 BEVERAGE MERCHANDISER: Provide two (2) Utility Refrigerator model # PTR-30-SS-2SLG-2SLG-N-C*J088 refrigerated merchandisers, 36" wide x 24" deep x 60" tall. Stainless Steel front, back, sides and interior finish. Self-contained refrigeration. Full-height sliding glass doors on each side with locks, per unit. Three (3) chrome shelves on adjustable pilasters per cabinet. Standard LED lighting with Manual ON/OFF switch. 20 volt NEMA 5-15P cord and plug. Unit provided with two (2) locking and two (2) non-locking 6" swivel casters.

ITEM # 56 BACK COUNTER: Provide one (1) Advance Tabco model #SS-245*J088, Work Table, 60"W x 24"D, 14 gauge 304 stainless steel top, 18 gauge adjustable stainless steel undershelf, stainless steel legs & adjustable bullet feet, NSF certified, including;

A. One (1) model #TA-61*J088, Modification to reduce length,,,54" LONG.
B. Five (5) feet model #FAB-X*J088, Partial back splash, eight (8") inches high (per linear foot).
C. One (1) model #TA-22*J088, Square edge table.
D. One (1) model #TA-76*J088, Paint on sound deadening under top (supplements standard sound deadening under support channels) (each).
E. One (1) model #TA-23*J088, Welded Set Up Table/Shell Crating (per table).
F. Five (5") ft, Model # TA-94*J088, sixteen (16) gauge 304 stainless steel undershelf upgrade (per linear foot).
G. One (1) model #TA-95*J088, sixteen (16) gauge 304 stainless steel leg upgrade (per table).

ITEM # 57 MILK COOLER: Provide two (2) Mod-U-Serve model #MCT-SM1 milk cooler, including:

A. 34"L x 30 ½" W x 42"H
B. 120v, 1/3hp, 1ph, 8 amp, NEMA 5-15P
C. Eight (8) 13" x 13" x 11" case capacity
D. Interior Liner: 18-gauge stainless steel fully welded liner with breaker strip attachment to exterior panel
E. Exterior: 20-gauge stainless steel
F. Doors: 20-gauge double pan insulated doors with balloon gasket
G. Insulation: High pressure foamed in place 2" thick polyurethane
H. Condensing Unit: R22 high temperature hermetically sealed with expansion valve and pressure switch operation
I. Condensing Unit Housing: Front and rear removable louver panels for flow through air design
J. Drain: ½" stainless steel nipple fully welded to interior drain liner with brass gate valve at exterior
K. Corner Bumpers: Rubber bumpers provided on each corner
L. Casters: Heavy-duty five (5") inch diameter plate casters with brake models at rear corners of cabinet
M. Stainless steel specification: All stainless steel to be type 304 with number four finish
N. Five (5) year compressor body warranty.

ITEM # 58 UTILITY CART: Provide six (6) total – (two (2) not shown on plan) Metro model #BC2636-3DBL*J088, Deep Ledge Utility Cart, 3-tier with open base, 38-3/4"W x 27"D x 41"H, adjustable polymer shelves with 2-3/4"H ledges on all sides, 150lbs per shelf capacity (400lbs total capacity), handle on short side, with (4) swivel/resilient tread casters, black, no-tool assembly, NSF certified.

ITEM # 59 FLAT TOP COUNTER: Provide two (2) Mod-U-Serve model #MCT-FT3-MOD*J088, counters, each including:

A. Module at thirty-four (34”) inches above finished floor.
B. Stainless steel construction
C. Twelve (12”) inch stainless steel trayslide with inverted “V” runners on fixed brackets with LED lights. Trayslide at thirty (30”) inches above finished floor.
D. Tile front application by Mod-U-Serve. Panels raised and extended to cover stainless steel mullions.
E. Line up locks
F. Serving lines to be provide with 6” stainless steel legs with adjustable bullet feet.
G. One (1) recessed 120 volt Duplex Receptacle below counter top with grommetted hole
H. Stainless steel undershelf and removable intermediate stainless steel shelf
I. One (1) stainless steel interconnect box, 120/208 volt, 3 phase, 80 amp service with twist lock receptacles and point of use breakers. Interconnect box to provide electrical service to half of serving line via daisy chain system.
J. All switches to be centrally located in common control panel assembly with removable front for ease of maintenance and service.

ITEM #59.1 HOT/COLD FOOD COUNTER: Provide two (2) Mod-U-Serve model #MCT-H/CF3-H/CF2-MOD*J088, counters, each including:

A. One (1) three (3)-pan capacity and two (2)-pan capacity, 12” x 20” drop-in, mechanically heated and cooled hot/cold wells with self-contained refrigeration. Modified size and configuration per drawing.
B. Module at Thirty-four (34”) inches above finished floor..
C. Stainless steel construction.
D. Twelve (12”) inch stainless steel trayslide with inverted “V” runners on fixed brackets with LED lights. Trayslide at Thirty (30”) inches above finished floor..
E. Tile front application by Mod-U-Serve. Panels raised and extended to cover stainless steel mullions.
F. Line up locks.
G. Serving lines to be provide with 6” stainless steel legs with adjustable bullet feet.
H. Hot and cold water fill faucet with blending valve and flex hose.
I. Single tier, Elite Series self-service breath shield with ajustable front glass, end panels and LED lights and Hatco series heat strip over each section.
J. Two (2) recessed 120 volt Duplex Receptacles in counter body side to accomdate items #55 and #57.
K. All switches to be centrally located in common control panel assembly with removable front for ease of maintenance and service.

ITEM #59.2 HOT/COLD FOOD COUNTER: Provide two (2) Mod-U-Serve model #MCT-H/CF4-CFSP2-MOD*J088, counters, each including:

A. One (1) four (4)-pan capacity, 12” x 20” drop-in, mechanically heated and cooled hot/cold wells with self-contained refrigeration. One (1) elevated cold food sheep pan, two (2) 18” x 26” sheet pan capacity, mechanically refrigerated. Modified size and configuration per drawing, including tray pass and flat top space.

B. Module at Thirty (30”) inches above finished floor.
C. Stainless steel construction
D. Twelve (12”) inch stainless steel trayslide with inverted “V” runners on fixed brackets with LED lights. Trayslide at thirty (30”) inches above finished floor..
E. Tile front application by Mod-U-Serve. Panels raised and extended to cover stainless steel mullions.
F. One (1) 120 volt receptacle with grommetted hole per module.
G. Line up locks.
H. Serving lines to be provide with 6” stainless steel legs with adjustable bullet feet.
I. Hot and cold water fill faucet with blending valve and flex hose.
J. Single tier, Elite Series self-service breath shield with ajustable front glass, end panels and LED lights and Hatco series heat strip over each section.
K. All switches to be centrally located in common control panel assembly with removable front for ease of maintenance and service.

ITEM #59.3 ICE CREAM COUNTER: Provide one (1) Mod-U-Serve model #MCT-DI-IC-2020-MOD counters, each including:

A. Two (2) 20” x 20” ice cream wells, mechanically chilled, with clear bi-fold hinging lids and locking bar.
B. One (1) Slanted stainless steel snack rack with LED Light over each ice cream unit
C. Stainless steel construction
D. Twelve (12”) stainless steel trayslide with inverted “V” runners on fixed brackets with LED lights. Trayslide at 30” inches above finished floor.
E. Tile front application by Mod-U-Serve. Panels raised and extended to cover stainless steel mullions.
F. Line up locks
G. Serving lines to be provide with 6” stainless steel legs with adjustable bullet feet.
H. All switches to be centrally located in common control panel assembly with removable front for ease of maintenance and service
I. All switches to be centrally located in common control panel assembly with removable front for ease of maintenance and service.

ITEM #59.4 CASHIER COUNTER: Provide one (1) Mod-U-Serve model #MCT-CRDB counter, including:

A. Single Cashier Stand. Modified size and configuration per drawing
B. Stainless steel construction
C. Twelve (12”) inch stainless steel trayslide with inverted “V” runners on fixed brackets with LED lights. Trayslide at 30” inches above finished floor.
D. Tile front application by Mod-U-Serve. Panels raised and extended to cover stainless steel mullions.
E. Line up locks
F. Serving lines to be provide with 6” stainless steel legs with adjustable bullet feet.
G. Two (2) all 18-gauge, type 304 series stainless steel cash drawers with extension slides and cylinder lock. 3” deep stainless steel liner
H. Two (2) Grommeted hole for POS cables.

ITEM # 60 CASH REGISTER: BY OWNER

ITEM # 61 MENU BOARD: BY OWNER

ITEM #62 SPARE NUMBER

ITEM #63 SPARE NUMBER

ITEM # 64 STAINLESS STEEL WALL PANELING: Provide two (2) lots custom fabricated panels, size and shape as per plan, elevation, sections, details, and general specifications, including:

A. Eighteen (18) gauge, type 304 stainless steel panels from floor to bottom edge of exhaust hood.
B. Contain raw edges in stainless steel trim strips.

ITEM # 65 STAINLESS STEEL CORNER GUARDS: Provide twenty (20) custom fabricated corner guards, size and shape as per plan, elevation, sections, details, and general specifications, including:

A. #14 gauge stainless steel construction per detail.
B. Attach to wall with approved mastic, do not use screws. All exposed edges to be sealed to finished wall with approved silicone.

ITEM # 66 HAND WASH SINK: Provide one (1) Advance Tabco model # 7-PS-50*J088, Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 stainless steel, with splash mounted faucet, lever drain with overflow, P-trap, wall bracket, NSF, and cCSAus certified.

A. 12” high, welded end splash where indicated on plan.

ITEM #67 SOILED DISHTABLE w/ PASS WINDOW FRAME AND SILL: Provide one (1) Aerowerks custom fabricated unit, size and shape as per Aerowerks drawing #P200667

A. Provide full perimeter window frame manufactured from 16 ga. stainless steel finish integral with Soiled Dish Table. Food Service Equipment Contractor to verify window opening with architectural drawings and coordinate with the installation of Contractor installed overhead coiling shutter.
B. Provide NSF Listed Soiled Dish Table, 14 ga. stainless steel top as shown on plan. Table shall be formed with vertical and horizontal corners coved to a 3/4” radius. Provide Soiled Dish Table with two (2) quick drains, one (1) disposer control panel bracket, cutout for vacuum breaker and cutout for the disposer cone. Provide pre-rinse spray as shown on plan. K.E.C. to provide water line mounted under soiled dish table to disposer by plumbing contractor. Support table on 1-5/8” Ø stainless steel legs with adjustable s/s bullet feet. Legs shall be positioned to align up front-to-back for maximum access for cleaning. Legs shall be supported with 12 ga. stainless steel leg channels. All cross rails shall be fully welded to legs with all welds polished and ground smooth.
C. Provide and install one (1) Salvajor Company model #300-CA-18-ARSS-LD disposer, including T. & S. Brass and Bronze Works, Inc., model #B-0456-04 vacuum breaker assembly and 1/2” solenoid valve with time delay relay and flow control. Set time delay relay to run water for a minimum of 45 seconds after shut-off. Weld cone watertight where shown on plan.
D. Provide and install one (1) T. & S. Brass and Bronze Works, Inc., model #B-0113 pre-rinse spray with model #B-0109 wall bracket where shown on plan.

ITEM # 68 DISH MACHINE w/INTEGRAL BOOSTER HEATER: Provide one (1) Hobart Model #CL44eN dish machine, including:

A. 44” Single tank conveyor dish machine with high temperature sanitizing.

B. Prewash and wash motor to be 2 HP with inherent overload protection and manual reset located on the motor. Stainless steel pump and impeller system. Electrical interface points for chemical connections provided as standard.
C. All stainless-steel construction with insulated hinged double doors with door interlock switch.
D. Dishwasher to be provided with 15 KW electric immersion tank heater
E. Optional built-in pressure less SST 30 kw electric booster heater
F. Optional table limit switch
G. Optional higher than standard height chamber opening to 22 x 24 inches
H. Vent fan and booster heater controls. (exhaust fan by Mechanical Contractor).
I. Optional two adjustable (2) Vent cowl collars, 4"x 16"x 7" high w/adjustable and locking dampers. VNTHD/E-ADJ
J. Standard unit to include Opti-Rinse™ system using no more than .62 gallons per rack at 20 psi.
K. Standard programmable NSF Pot & Pan conveyor dwell
L. Standard programmable De-Lime Alert
M. Standard features to include a dirty indicator with an optional shut down mode, energy saver mode, low temperature alerts for all zones, service diagnostics, de-lime notifications, operating indicators
N. Two (2) #18-gauge stainless steel fully welded seamless ducts extended to ceiling with #18-gauge stainless steel fully welded trim collars at ceiling per details on drawings. Fit vent ducts inside hood connections so condensate runs inside hoods. (By KEC)
O. Machine to have full one-year warranty on parts, labor, and mileage against manufacturer's defects.
P. Provide eight (8) Carlisle #RP14-OptiClean peg racks and four (4) Carlisle #RSP-OptiClean dishracks and four (4) Carlisle #RF14-OptiClean combination racks

ITEM # 69 CLEAN DISH TABLE EXTENSION: See Item #71

ITEM #70 POWERED UNLOADER: Provide one (1) Aerowerks TT90UL unit, size and shape per Aerowerks drawing #P200667

A. Motor-powered turn track made from stainless steel with polyethylene guides for top and return side. Entire drive chain assembly shall be supported inside a 14 ga. stainless steel pan. Provide 1-5/8” Ø stainless steel tubing legs with adjustable feet. Provide plastic pivot-radius chain, motorized, to pull 20” x 20” dish racks around a tight radius so that overall powered curve dimension from end of rollers to far side of table is no greater than 34”. Inside radius of unloader shall be equipped with stub rollers to support racks on inboard side. Unloader shall be equipped with an emergency stop which also stops dish machine.
B. 208v 3ph – 15a Connection: 1-1/2” drain (Qty: 1)

ITEM # 71 CLEAN DISH TABLE: Provide one (1) Aerowerks custom fabricated unit, size and shape as per Aerowerks drawing # P200667

A. Provide NSF Listed Roller Table, 14 ga. stainless steel formed with vertical and horizontal corners coved to a 3/4” radius. Table shall be equipped with hemmed edges. Hem edge would extend approx. 2” above top of rollers. Table shall be connected to exit end of dish machine to provide a drip-proof connection. Slope table to drain, built into Tite Turn where shown on plan. Table shall be designed to accept a gravity roller conveyor to carry dish racks from dish machine smoothly. Rollers shall be 1.9” Ø stainless steel, fitted with polypropylene bearings with stainless steel balls. Rollers shall be spaced at approximately 5-1/2” centers. Shafts shall be 7/16” hexagon

aluminum securely bolted to side rails. Side rails shall be 1/8” x 2” stainless steel resting on support pins welded to side of conveyor bed to keep rollers elevated above bottom of bed for effective draining of water from dish racks. Table to be supported on 1-5/8” Ø stainless steel legs with adjustable flanged feet to be anchored with 3/8" bolts. Legs would be supported on 12 ga. stainless steel leg channels. All cross rails to be fully welded to legs with all welds polished and ground smooth.

B. Provide NSF Listed Clean Dish Table, 14 ga. stainless steel formed with vertical and horizontal corners coved to a 3/4” radius. Table shall be equipped with turned up side with rolled edge and backsplash along the wall. Table shall be connected to exit end of Tite turn to provide a drip-proof connection. Table to be supported on 1-5/8” Ø stainless steel legs with adjustable s/s flanged feet to be anchored with 3/8" bolts. Legs would be supported on 12 ga. stainless steel leg channels. All cross rails to be fully welded to legs with all welds polished and ground smooth. Provide a pre-wired accumulation switch at end of clean table integrated with dish machine to shut machine off when a rack reaches the end of the table.
C. Connection: 1-1/2” Ø drain (Qty: 2) Connection: 1/2” Ø H & C water. (Qty: 1)

ITEM # 72 MOBILE TRAY DISPENSERS: Provide four (4) Delfield Shelleymatic model #TT-1014 dispensers, each including:

A. N.S.F. approved casters.
B. Corner bumpers.
C. Calibrated and sized to accommodate Owner’s trays.

ITEM # 73 HAND WASH SINK: Provide one (1) Advance Tabco model # 7-PS-50*J088, Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 stainless steel, with splash mounted faucet, lever drain with overflow, P-trap, wall bracket, NSF, and cCSAus certified.

A. 12” high, welded end splash where indicated on plan.

ITEM # 74 DISH DRYING RACK: Provide one (1) Cambro Camshelving Premium shelving, including:

A. Eighty-four (84”) inch high stationary posts
B. Two (2) tiers of shelves with vented shelf mats per shelving section
C. Two (2) tiers angled drying racks, eight (8) slot each.
D. One (1) tier vertical drying rack, seven (7) slots each.
E. One (1) Camshelving Premium dunnage support, 7-1/2” high per shelving section
F. Vertical posts and horizontal traverses are made of a steel core coated with a smooth polypropylene exterior. Reinforced nylon foot on bottom of each stationary post adjusts easily for floor irregularities.
G. Post connectors and shelves up to 48" long hold up to 800 lbs. evenly distributed static weight. Shelves 54" - 72" long hold up to 600 lbs. each.
H. Molded in dovetails on posts ensure that traverses set easily into place. Shelves and traverses can be adjusted at four (4") inch increments. The shelf traverses can be easily removed and washed in a conveyor dishwasher.
I. Works in temperatures -36˚F to 190˚F. All components are weldless, rust free with no exposed metal. Lifetime warranty against rust and corrosion.
J. Shelf plates are removable and can contain Camguard an antimicrobial technology incorporated throughout the shelf plate material, that will never wash off or wear out, and inhibits the growth of mold, fungus and bacteria.
K. Assembles with the use of a rubber mallet, requiring no bolts or nuts, clips or stainless-steel connectors.

PART 4 – EXECUTION

INSPECTION:

Before beginning the installation of foodservice equipment, the spaces and existing conditions shall be examined by the foodservice equipment supplier and any discovered deficiencies or discrepancies noted shall be reported to the Architect in writing.

Beginning installation shall constitute acceptance of the area.

PREPARATION:

Foodservice equipment drawings are diagrammatic and intended to show layout, arrangement, mechanical and electrical requirements.

Make and check all measurements at the building before beginning fabrication. Coordinate measurements and dimensions with rough-in and space requirements.

INSTALLATION:

Equipment shall be uncrated, fully assembled and set level in position for final connections. Parts shipped loose but required for connection shall be properly tagged and shall be accompanied by the necessary installation instructions.

Provide a competent, experienced foreman to supervise installation and final connections.

Division 22 shall clean and flush all supply and drain lines before final connections.

Water inlets shall be located above the positive water level. Where conditions require submerged inlets, fixtures shall be equipped with vacuum breaker and approved check valve by Division 22.

REMOTE REFRIGERATION SYSTEMS:

The systems as indicated shall be complete and shall include all necessary labor to make a first-class installation. Contractor shall provide all necessary expansion valves, hand shut-off valves, dryers, sight glasses, thermostats, solenoid valves, high and low pressure controls, heat exchangers, line vibration eliminators and tubing. Provide schematic of proposed hookup to Consultant prior to installation for approval.

Heat exchangers are to be furnished and installed for all direct installations. Crankcase heaters to be provided in compressors for outside installation.

Furnish and install at each unit a liquid and suction line shut-off valve as closely as practical to the equipment. Install in each system a pump down valve take-off connection.

Expansion valves shall be thermostatic type, adjustable super-heat. Backpressure regulating valves shall be used on multi-plexed systems.

All refrigerant lines shall be type "L" hard copper tubing as required by approved installation practices. Where conduits are provided by others, the tubing shall be soft copper pulled through this conduit. For exposed areas, hard copper tubing shall be run in such a manner as to not subject it to undue damage. All refrigerant lines in pipe sleeves, or conduits shall be effectively caulked at ends to prevent entrance of water or vermin. All lines not in conduit shall be insulated with Armstrong

Armaflex foamed plastic 1" insulation, which is to be taped and glued at joints. No slit insulation will be accepted. All refrigerant piping shall be joined by use of Sil-Foz high temperature silver solder with proper fittings.

Finish exposed refrigerant lines within refrigerated compartments with “All Weather Aluminum” paint.

Armstrong Armaflex line insulation on exterior of buildings to be covered with ITW Pabco/Childers (or equal) Aluminum Roll Jacketing manufactured from alloys 3105 and 3003, conforming to ASTM B-209 designation with a minimum thickness of .016”. This is to help prevent deterioration due to sun exposure.

Sizing of liquid and suction lines shall be according to ACRMA standards. All systems shall be subjected to a 20" vacuum for a period of 24 hours with no regain. Support all suspended lines with adjustable hangers 6'-0" on centers maximum.

Contractor shall provide CFC free refrigerant and oil, charge the system and run an operational check of three (3) days duration and provide oil separators in all instances where the condensing units are located above the refrigerating coil. Warranty shall be as hereinbefore described.

FIELD QUALITY CONTROL:

Inspection: Provide access to shop fabrication areas during regular working hours to facilitate inspection of the equipment, during construction, by the Architect or his authorized representative. Errors found during these inspections shall be corrected to the extent required within the scope of the plans, specifications and reviewed drawings.

Testing: After completion of final connections, thoroughly test all equipment for proper operation.

Repair or replace any equipment producing objectionable noise.

Finishes marred during installation shall be repaired to the Consultant's satisfaction or replaced.

Start-up and Demonstration: Provide a start-up and operating demonstration of all equipment at a time of Owner's convenience.

Arrange for the demonstration to be held in the presence of authorized representatives of the Architect and the Owner.

Demonstrations to be conducted by Manufacturer’s Representative and Equipment Supplier in the proper operation and maintenance of the equipment. When possible and available by the manufacturer, training videos are to be provided at no charge to the Owner.

One (1) copy of Operation and Maintenance Manuals as outlined in section marked “Quality Assurance” to be delivered to the Kitchen Manager at the time of demonstration for use on-site.

Foodservice Equipment Supplier is to furnish to the Owner, Architect and Foodservice Equipment Consultant confirmation of demonstration and delivery of Operation and Maintenance Manuals in the form of “A Letter” including a “Receipt” for the Manual and a copy of “Sign-In” Sheet signed by all Demonstrators and Attendees.

ADJUST AND CLEAN:

Upon completion of installation and tests, remove all protective coverings and clean and service all equipment.

Make and check final adjustments required for proper operation of the equipment.

Cleanup: Clean up all debris by the work of this section, keeping the premises clean and neat at all times.

QUALIFIED KITCHEN SUPPLIERS:

Kitchen and food serving equipment shall be furnished, installed, and guaranteed by one of the following named kitchen suppliers:

1. Amundsen Commercial Kitchens, Mr. Cary Amundsen, 1740 W. Main Street, Oklahoma City, Oklahoma 73106 405/236-5961, E-mail: Cary@afeok.com

2. Bargreen-Ellingson, LLC., Mr. Dustin Kennedy, 2521 East Loop 820 North, Bldg. 13, Fort Worth, Texas 76118, 817/732-6200, FAX 817/732-6210, E-mail: d.kennedy@bargreen.com

3. Edward Don & Co., Mr. Scott Jost, 36 W. Beauregard, Ste. 504, San Angelo, Texas, 76903, 325/658-5878, FAX 325/658-7920, E-mail: scottjost@don.com

4. Jean's Restaurant Supply, Mr. Bobak Mostaghasi, 426 South Staples, Corpus Christi, Texas 78401 361/884-9800, FAX 361/888-7602, Cell 361/549-7818, E-mail: bobak@jeansrestaurantsupply.com

5. Kirby Restaurant Supply, Mr. Billy Anderson, 809 S. Eastman Road, Longview, Texas 75602, 903/757-2723, FAX 903/757-9519, E-mail: michaelp@kirbyrestaurantsup.com

6. Kommercial Kitchens, Mr. Terry Woodard, 1100 Freeway Blvd., Rose City, Texas 77622, 800/962-1555, FAX 409/769-8800, E-mail: Shannon@kommercialkitchens.com

7. Kitchen Resources, Mr. Bill Youngblood or Mike Mattar, 806 W Harrison,Harlingen,Texas 78550, 956-423-2491, FAX 956-423-3088

8. Lafayette Restaurant Supply, Inc., Mr. Scott Spurlock, 1103 Hugh Wallis Road S., Lafayette, LA 70508 337/235-4534, FAX 337/234-1803, E-mail: scott@lafrest.com

9. LoneStar Restaurant Supply, Inc., 8131 I-35N, Austin, Texas, 78753, 512/633-3446, FAX 512/467-9757

10. Mission Restaurant Supply Company, Mr. Bruce Walker, 6509 North Lamar Street, Austin, Texas, 78752, 512/389-1705, FAX 512/389-1746, E-mail: brucew@missionrs.com

11. Oswalt Restaurant Supply, Mr. Lloyd Crockett, 1015 N.W. 68th Street, Oklahoma City, Oklahoma 73116, 800/299-4044, FAX 405/840-4044, E-mail: lloyd.crockett@oswalt.biz

12. Pasco Brokerage, Inc., Ms. Kathryn Hollon or Ms. Emily Hart, 6465 Chase Oaks Blvd., Plano, Texas 75023, 972/596-3350, FAX 972/596-2817 E-mail: kathollon@pascoinc.net or ehart@pascoinc.net

13. Stafford-Smith, Inc., Mr. Mark Burden, 13370 Branch View Lane, Suite 160, Farmers Branch, TX 75234, 972/800-5269, email: mburden@staffordsmith.com

14. Supreme Fixtures Co., Inc. Mr. Tim Hampel, 11470 Hillguard Rd., Dallas, TX 75243, 501/455-2552, FAX 501/455-0802 email: tim@supremefixture.com

15. Texas Metal Equipment Company, Mr. Stephen Trawnik, 8704 Royal Lane, Irving, Texas 75063, 214/446-7206, FAX 214/446-7209, E-mail: strawnik@txmetalequip.com

16. Waco Hotel Supply Company, Inc., Shaleen Tillman, 308 Lake Air Drive, Waco, Texas 76714-7933, 254/772-8600, FAX 254/772-1158, E-mail: whsc@advanceone.net

QUALIFIED FABRICATORS:

All fabricated Items described in the specifications, other than by the catalog numbers shall be manufactured by an N.S.F. approved Foodservice Equipment Fabricator who has the plant, personnel and engineering facilities to properly design, detail and produce high quality foodservice equipment. All fabrication shall have N.S.F. labels and be by one (1) manufacturer and be of uniform design and finish.

The Foodservice Equipment Contractor shall, if requested, submit a list of at least three (3) comparably-sized projects for which the intended Foodservice Equipment Fabricator has furnished custom fabricated equipment.

END OF SECTION 11 4000

SECTION 11 5200

AUDIO-VIDEO EQUIPMENT

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.

B. Documents: Provisions of General Conditions, Supplementary Conditions, and the sections included under Procurement & Contract Requirements are included as part of this section as though bound herein.

1.02 SUMMARY

A. Section Includes
   1. Integrated Audio-Video Equipment Hardware
   2. Configuration Software
   3. Control Interfaces
   4. Power Supplies
   5. Television Displays

B. Related Requirements
   1. Section 01 0000 General Requirements
   2. Section 27 5116 Public Address Systems
   3. Section 28 0511 Cyber Security Requirements
   4. AVIXA Rack Building for Audiovisual System 2019
   5. AVIXA Cable Labeling for Audiovisual Systems
   6. AVIXA Audiovisual Systems Performance Verification
   7. ANSI/TIA-568 Commercial Building Telecommunications Cabling Standard
   8. ANSI/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces.
   9. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual.
   10. "Basic Principles for suspended Loudspeaker Systems", Technical Notes Volume 1, Number 19, JBL Professional or latest edition.
   11. "Handbook for Riggers" 1977 Revised Edition, Newberry, W.G., Calgary, Alberta Canada.
   12. Underwriters Laboratory (UL) listed and recognized equipment and materials.
   13. Americans with Disabilities Act (ADA)
   14. In the event of a conflict between documents referenced herein and the contents of this specification, the contents of this specification shall be considered the superseding document except for the ADA, NFPA and NEC publications.

1.03 DEFINITIONS

A. AVIXA: Trade association representing the professional audiovisual and information communications industries worldwide.

B. CTS: Certified Technology Specialist

C. EMI: Electromagnetic interference.

D. RBB: Rack bonding busbar. A busbar within a cabinet, frame, or rack.

E. RBC: Rack bonding conductor. Bonding conductor from the rack or rack bonding busbar to the telecommunications equipment bonding conductor.

F. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

G. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

H. S/FTP: Overall braid screened cable with foil screened twisted pair.

I. S/UTP: Overall braid screened cable with unscreened twisted pairs.

J. TBC: Telecommunication Bonding Conductor. The TBC bonds the AV-PBB to the service equipment (power) ground. Formerly known as the bonding conductor for telecommunications.

K. TEBC: Telecommunications equipment bonding conductor. A conductor that connects the primary bonding busbar, secondary bonding busbar or supplementary bonding network to equipment racks or cabinets, rack bonding busbars or rack bonding conductors.

L. Federal Communications Systems (FCC).

M. Institute of Electrical and Electronics Representatives (IEEE).

N. National Electrical Manufacturer's Association (NEMA).

O. National Fire Protection Association (NFPA) Publications (Latest revisions and pertinent addendums).

1.04 PERFORMANCE REQUIREMENTS

A. In the installation of this work, the Contractor shall comply with the requirements of Owner's standards, local and state laws and ordinances and the National Electrical Code.

B. Anything in the Drawings or Specifications that shall not comply with the above laws, ordinances, and rules, shall be referred to the attention of Owner's representatives for a decision before proceeding with that part of the work.

C. Performance References:
   1. The Contractor shall submit a minimum of three (3) references with names, addresses and telephone numbers of the operating personnel who can be contacted regarding previous installed systems of similar size and scope.
   2. Submitting incomplete or inaccurate reference information can be a reason to disqualify bidding Contractor.

1.05 SYSTEM & SUBSYSTEM REQUIREMENTS

A. Hardware: Contractor shall supply equipment, accessories, cables, and connectors necessary for system to operate according to stated functional requirements, whether said products are listed.

B. Software: Contractor shall utilize manufacturer's official and current version of configuration software at the time of installation.

C. Control Interfaces: Shall be labeled or configured with graphical user interface as appropriate.

D. Power Supplies: As required, Contractor shall provide necessary power supplies for devices requiring DC voltage.

E. Uninterruptible Power Supplies (UPS): Contractor shall provide a minimum of one managed UPS per audio-visual equipment rack for all pre-power amplifier equipment, whether specified or shown. Signal processing equipment and a minimal amount of audio amplifiers shall be connected to the UPS to allow for the Owner to announce emergency instructions of the audio-video system if desired.

F. Unless otherwise provided in the Specifications, reference to any equipment, material, article, or patented process, by trade name, make or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. If the respondent wished to make a substitution to the Specifications, the respondent shall furnish to the Representative Consultant the name of the manufacturer, the model number, and other identifying data and information necessary to aid the Representative Consultant in evaluating the substitution, and such substitution shall be subject to the Representative Consultant's approval. Substitutions shall be approved only if determined by the Representative Consultant to be equivalent to that specified. A proposal containing a substitution is subject to disqualification if the Owner's representative does not approve the substitution. Quantities of products shall be verified with drawings and any discrepancies reported to the Owner's representative in writing for resolution.

G. Unapproved product substitutions which have been provided and/or installed shall be replaced with the specified products at Contractor's sole expense.

H. Furnish all accessories necessary to integrate each piece of equipment into the system including rack mounts and other mounting devices, special connectors, and interfaces.

I. Coordinate with Architect the finish of all exposed items to blend with adjacent architectural elements of the building.

J. Major components of the system such as DSP, power amplifiers, mixer-preamplifiers, and tuners, shall have a device, whether internal or external, which provides protection against voltage spikes and current surges originating from commercial power sources.
   1.

1.06 QUALIFICATIONS

A. Contractor
   1. The Contractor must show proof that A/V system integration is the primary function of the company.
   2. The Contractor shall provide proof that it supports a well-trained maintenance force in the area local to the project.
   3. The Contractor must maintain a fully staffed installation and service facility equipped with appropriate test equipment for repair of systems such as those specified herein.
   4. The Contractor shall be, or have direct relations through their subcontractors, an approved manufacturer's representative for all products they furnish and install.
   5. The Contractor shall be certified by the manufacturing company in all aspects of design, installation, and able to provide warranty service of the products described herein.
   6. The Contractor shall utilize the authorized manufacturer components in provisioning this project.
   7. The Contractor shall show proof that it has been in the A/V system installation business for a period of not less than 3 years and has successfully, completed projects of equivalent size and scope.
   8. Contractor shall have a documented quality assurance program. This program shall have internal inspection team(s) to measure the service and product quality produced by the Contractor’s technicians against internal and Industry standards.
   9. Contractor shall comply with all federal, state and local statutes regarding qualifications of firms.
   10. The Contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size.
   11. The Contractor shall own and maintain tools and equipment necessary for successful installation of optical and Category 6/6A metallic premise distribution systems.
   12. The Contractor shall have personnel who are adequately trained in the usage of such tools and equipment.
   13. The use of uncertified subcontractors to the Contractor is not permitted.
   14. Contractor must provide on-site supervision and project management by person(s) with a minimum of AVIXA CTS certification.
   15. To facilitate timely service and warranty onsite requirements, the Contractor must have an established office located within 75 miles of the project.

B. Manufacturer
   1. Manufacturer shall have a minimum of ten (10) years’ experience in the manufacture of audio-video system products.
   2. Maintain a 24-hour toll free telephone assistance line or online presence for Owner and installer support.

1.07 SUBMITTALS

A. Action Submittals:
   1. Contractor shall submit an electronic PDF copy of the submittal package within 15 days of written notification to proceed or other written documentation from the Architect or General Contractor. Sheets within the PDF shall be organized into the following sections:
   2. Cover Sheet and Section 1 ─ Information, and Material

a. Cover sheet containing the Company Name and/or logo, Title of submittal package, project name, and Contractor work address with a point of contact (POC) and phone number.

3. Section 2 ─ Product Data
   a. Manufacturer's catalog information showing dimensions, colors, and configurations.
   b. Submittals shall include all items listed in PART 2 – PRODUCTS of this document and the Manufacturers cut sheets for the following:
      1) Manufacturers cut sheets for all products. Lengthy installation manuals shall not be submitted.
      2) In cases of multiple product numbers on a single cut sheet, the Contractor shall identify the proper part number with a black X, check mark, or highlight.

B. Informational Submittals:
1. Section 1 ─ Pre-Qualification Certificates
   a. Contractor shall submit the following documents:
      1) A letter of approval from the manufacturer indicating completion of pre-qualification requirements.
      2) Training certificates for design, representative and installation of the proposed products.
2. Section 2 ─ Warranty Documentation
   a. Provide example of documentation regarding the Contractor's warranty.
3. All submittals shall be delivered to the Architect without incomplete documentation. Submittals missing cut sheets, drawings, certification documents or are not properly filled out per this section shall be summarily rejected in whole. Supplying partial submittal packages for the purpose of ordering materials is not an approved practice and shall be rejected in whole.
4. The low voltage pre-construction meetings for all Division 11 (AV), 27 and 28 integrators shall be delayed until Contractor has received approved submittal packages from the Consultant.

C. Closeout Submittals:
1. Upon completion of final representative and incorporation of the Architect review comments, Contractor shall provide to the Architect for its records the following close out documentation:
2. Record or As Build Drawings which shall include but not limited to:
   a. Functional block diagrams for each integrated audio-video system.
   b. All integrated audio-video or audio-visual junction box locations.
   c. Audio visual equipment rack locations.
   d. Rack elevations.
      1) Rack elevations shall show all components as installed under this contract.
      2) Contractor shall label each component describing the component. (Examples: Cafeteria Amplifier or Gymnasium DSP etc.).
   e. Floor plan drawings with device locations and associated assigned item number.
   f. Mounting detail for equipment and hardware.
   g. Schedule of all devices with associated panel termination, zoning, power circuits, etc.
   h. Corrected product submittal information.
3. A complete inventory list of installed products shall include:
   a. Manufacturer name.
   b. Model number.
   c. Serial number.
   d. Room number and/or description of installed location.
4. Operation and Maintenance Manuals shall include:
   a. Include detailed procedures for system operation that begin with startup procedures and continue through system shut down referenced in section 3.3 Training.
   b. List of manufacture recommended maintenance and intervals with manufacture support contact information.

D. Drawings shall contain the Contractors own title block on the edge of the drawing and shall include the company name, address, phone number and date of the final drawings. Use of any part of the Architect title block is not acceptable at any time.

E. Drawing documentation shall be in the following format:
   1. Two (2) electronic copies, one per flash drive, shall be provided.
   2. Drawings shall be in both CAD (DWG) and PDF format, and the Contractor shall include all files on each drive.
   3. File transfer is acceptable.

F. Drawings shall be provided to the Architect two weeks prior to the final testing and commissioning of the system. Coordinate with the Owner during the pre-construction meeting for Contractor to schedule this delivery date.

G. The drawings shall be reviewed on site with the Architect and the Owner prior to the final acceptance process. Drawings rejected for any reason shall delay the final acceptance process until resolved.

H. Testing Results
   1. In addition to the project record drawings, the Contractor shall provide the testing information for all audio-visual cabling.
   2. Test results shall be provided to the Architect two weeks prior to the expected final acceptance of the system(s). Coordinate with the Owner during the pre-construction meeting for low voltage Contractors to schedule this delivery date.
   3. The drawings shall be reviewed on site with the Architect and the Owner prior to the final acceptance process. Test results rejected for any reason shall delay the final acceptance process until resolved.

1.08 QUALITY ASSURANCE

A. The Contractor is bound by the intent of these Specifications to provide a complete and functional audiovisual system that meets the requirements of AVIXA Audiovisual Systems Performance Verification including but not limited to:
   1. ICS control functionality, verification of presets, volume controls, mute controls, etc.
   2. Stable operation, completely free of feedback and distortion throughout the entire range of available ICS controls.
   3. Correct routing of all signals to intended destination.
   4. Unity gain structure.
   5. Output transducer (speaker protection processing functionality).
   6. Audio Echo Cancellation functionality

B. Provide measurement test results per ANSI/InfoComm 1m-2009 ACU.

C. Outdoor sound system measurements shall be provided at a minimum of one measurement per 50 seats. Measurements shall be performed using pink noise test signal at a volume congruent with nominal system operation. Measurements shall indicate:
   1. Site plan map of seating areas and test locations.
   2. Frequency response from 40Hz-16kHz in 1/3 octave resolution.
   3. SPL (A weighted) of the test signal as measured from each location.
   4. Weather condition at time of test; including temperature, humidity and average wind speeds.

D. Loudspeaker performance shall exhibit frequency response of +/-3dB from 40Hz to 8kHz throughout 70% of the listening area, and +/-6dB throughout the remaining listening area.

E. Provide all necessary labor, materials, tools, transportation, services, ancillary items and coordination to furnish the Owner a complete turnkey system as described herein.

F. The Owner's representative shall make regular progress inspections. The Contractor shall make their job supervisor available to assist during these visits.

G. The Contractor shall thoroughly familiarize themselves with the complete construction documents, to have visited all sites affecting the proposed work, studied bid package information and all necessary

details of the complete set of drawings and Specifications and to have included in the proposal an amount to cover all work.

H. The Contractor shall keep a complete set of drawings, specification, reviewed submittals and progress markups on the job site always. These documents shall be made available during Owner's representative site progress visits. Changes made during installation shall be noted in the project markup set.

I. Submission of bids shall be deemed evidence of Contractor’s knowledge, review, and examination of the construction documents.

J. Provide a competent supervisor and supporting technical personnel with a minimum of AVIXA CTS certification and is acceptable to the General Contractor, Owner and Consultant during installation. Notify the Owner's representative in writing prior to any project supervisor replacement.

1.09 DELIVERY STORAGE AND HANDLING

A. Deliver, Storage and Protection
   1. Contractor shall verify all site conditions are suitable for delivery of product.
   2. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
   3. Contractor shall provide all equipment and materials necessary for the delivery of materials safely and securely on site.

1.10 PROJECT CONDITIONS

A. Damages
   1. The Contractor shall be liable for all damages to portions of the building caused by it, including but not limited to the following:
      a. Damage to any portion of the building caused by the movement of tools, materials or equipment.
      b. Damage to any component of the construction of spaces "turned over" to the Contractor.
      c. Damage to the electrical distribution system and/or other space "turned over" to the Contractor.
      d. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the Contractor or other actions of Contractor.

B. Other damage to the materials, tools and/or equipment of the Owner, its consultants, General Contractor, subcontractors, Architect, other Contractors, agents and lessees.

1.11 COORDINATION

A. Where connection between components or control features are accomplished over the Owner’s LAN, Contractor shall coordinate with the Owners IT department for IP addresses, firewall access, and other issues pertaining to successful integration.

B. Cooperate and coordinate as required with other Contractors who are responsible for work not included in this section.

C. Provide all information as required or requested by the Owner, Architect, Consultant or General Contractor for the project to be completed to the satisfaction of the Owner.

D. Notify General Contractor in a timely manner of system design or installation conflicts, which affect the intended use, or performance of the system.

E. Attend job construction and progress meetings that the Owner, GC, or Architect deems necessary.

1.12 WARRANTY

A. The Contractor shall warrant and guarantee all work against defects in material, equipment or workmanship for one (1) year from the date of substantial completion.

B. Provide manufacturer’s standard warranty on all products provided.

C. Upon receipt of written notice, Contractor shall remedy defects within thirty (30) days, or the Owner shall correct the defects and the Contractor, or its surety shall be liable for expenses.

1.13 BID

A. Contractor shall be required to provide the following documents with the bid response.
   1. Training certificates for design, engineering and installation of the proposed product types.
   2. A list of all current installations that shall be ongoing during this project, and the manpower requirements for each of those installations.
   3. Performance references as described herein. References with an invalid phone number shall be considered as an incomplete response and may be disqualified.
   4. Sample of the warranty that would be provided to the Owner when the installation is complete and documentation of the support procedure for warranty issues.
   5. Resume of qualification with the Contractor's bid proposal indicating the following:
      a. A technical resume of experience for the Contractor's Project Manager and on-site installation supervisor (Project Foreman) who shall be assigned to this project. The project manager shall have a minimum of 5 years' experience on projects of similar size and design. The Project Foreman shall have a minimum of 3 years related project experience working crews of 4 or more personnel with a minimum of AVIXA CTS certification.
      b. A list of technical product training attended by the Contractor's personnel that shall install the system.
      c. Any sub-Contractor who shall assist the primary Contractor in performance of this work shall have the same training and certification as the primary Contractor. The use of certified Subcontractors is not prohibited for this project.

PART 2 - PRODUCTS

2.01 CLASSROOMS / LABS

A. Coordinate with Owner a safe and acceptable storage location for equipment during construction activities.

B. Reference the AV functionals for connection information.

C. PROJECTOR (VP)
   1. Acceptable Manufacturer: NEC
   2. Acceptable Model: NP-ME403U

D. PROJECTOR MOUNT
   1. Acceptable Manufacturer: Peerless
   2. Acceptable Models:
      a. PJF2-UNV
      b. CMJ500

E. POWERED CEILING SPEAKER (S2)
   1. Acceptable Manufacturer: Cetacea
   2. Acceptable Model: ASTCLW1

F. AUDIO VIDEO WALL INPUT / OUTPUT PLATES
   1. Acceptable Manufacture: C2G
   2. Acceptable Model: 39870

G. HDMI CABLING
   1. Acceptable Manufacturer: C2G
   2. Acceptable Model: Active High-Speed HDMI Cables (Lengths as required)

H. OFCI WIRELESS AUDIO-VIDEO PRESENTATION
   1. Contractor to provide labor and materials for the installation of the Owner Furnished and Contractor installed ViVi wireless audio-video receiver.

2. Contractor to provide HDMI patch cabling as required to be connected to input 1 of the video projector and input 2 be connected to the classroom AV wall plate.
3. Acceptable Mounting Hardware: Roemtech
4. Acceptable Model: MagnaKlamp MK-2N

2.02 CONFERENCE ROOMS

A. Coordinate with Owner a safe and acceptable storage location for equipment during construction activities

B. FLAT PANEL DISPLAYS (TV-65”)
1. Acceptable Manufacturer: Samsung
2. Acceptable Model: QB65C

C. DISPLAY MOUNTING HARDWARE
1. Acceptable Manufacturer: Peerless
2. Acceptable Model: ST650

D. HDMI TX/RX KIT (AV-01)
1. Acceptable Manufacturer: Comprehensive
2. Acceptable Model: CHE-HDBTWP100K
   a. Provide with 15’ HDMI user cable and 6’ HDMI patch cable from receiver to display.

E. OFCI WIRELESS AUDIO-VIDEO PRESENTATION
1. Contractor to provide labor and materials for the installation of the Owner Furnished and Contractor installed ViVi wireless audio-video receiver.
2. Contractor to provide HDMI patch cabling as required to be connected to input 1 of the display and input 2 be connected to the HDMI receiver.
3. Acceptable Mounting Hardware: Roemtech
4. Acceptable Model: MagnaKlamp MK-2N

F. AV BRUSH PLATE (TV)
1. Installed behind all displays for AV cabling pass-through.
2. Acceptable Manufacturer: Vanco
3. Acceptable Model: 120817X

2.03 FIRESTOPPING

A. Provide products in compliance with local AHJ.

B. 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. STI
2. Hilti
3. 3M
4. Approved equivalent

2.04 WIRE AND CABLE

A. ACCEPTABLE MANUFACTURERS
1. Belden
2. West Penn
3. Crestron
4. Extron
5. Liberty
6. Windy City Wire

B. JACKS, CONNECTORS AND WALLPLATES
1. All custom A/V panels shall be minimum 1/8" brushed aluminum with engraved paint filled legends unless otherwise noted.

2. All AV connectors shall be Neutrik or Switchcraft brand (non-crimp) or approved alternative.
3. All HDBaseT and AV/IP connectors shall be Leviton or approved alternative.

PART 3 - EXECUTION

3.01 INSTALLATION AND PROGRAMMING

A. General Installation Expectations:

1. The Contractor shall provide and install a complete and functional audio-video system as specified within. The system shall be free from all defects, buzzes and hums.
2. If, in the opinion of the Contractor, there is anything in the Drawings or Specifications that shall not strictly comply with the ordinances, and rules, the matter shall be referred to the attention of Owner's representatives for a decision before proceeding with that part of the work. No change in the Drawings or in the Specifications shall be made without full consent in writing by the Owner's representative.
3. The Contractor shall obtain the Owner's permission before proceeding with any work necessitating cutting into or through any part of building structures such as girders, beams, concrete or tile floors, partition ceilings.
4. Contractor shall provide components, wire, connectors, materials, parts, equipment and labor necessary for the complete installation of the system, in full accordance with the recommendations of the equipment manufacturers and the requirements, Specifications and all applicable codes.
5. The Contractor shall be responsible for providing firestopping services for required audio-vdieo cable pathways.
6. The Contractor shall take necessary steps to ensure that the required firefighting apparatus is accessible always. Flammable materials shall be kept in suitable places outside the building.
7. The Contractor shall install the materials in accordance with the manufacturer's specifications.
8. Equipment shall be held firmly in place with manufacturers' recommendation and/or EIA standard types of mounting hardware. All equipment shall be installed to provide reasonable safety for the operator.
9. The Contractor shall promptly correct all defects for which the Contractor is responsible.
10. The Contractor shall ensure that all records and reports, City relations, engineering, metering, inspections, testing, quality or service standards and safety measures comply with standards applicable for the State where the work is being performed.
11. The Contractor shall coordinate all work with the Owner's assignee or as shall be designated at a future date.
12. The Contractor shall remove all excess material and debris and return to its original state of cleanliness. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap wire, etc., and dispose of such items daily.
13. Upon completion of installation and prior to acceptance, all equipment shall be thoroughly cleaned and made free from extraneous bits of soldier, wire, etc. by the Contractor. Contractor shall clean up work area and remove ALL waste and trash. Debris resulting from the installation shall be removed from all areas and disposed of by the Contractor.
14. It shall be the responsibility of the installation Contractor to furnish any special installation equipment or tools necessary to properly complete the installation.
15. The Contractor shall not roll or store cable reels without an appropriate underlay.
16. The Contractor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.
17. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded at any time during the placement facilities. Failure to follow the appropriate guidelines may require the Contractor to provide additional material and labor necessary to properly rectify the situation. This shall also apply to all damages sustained to the cables by the installation Contractor during the implementation.
18. All wiring, materials, and equipment must be listed and labeled by a nationally recognized testing laboratory.

19. All wiring, materials, and equipment must be suitable for the environment they are to be permanently installed in.
20. All equipment proposed by the Contractor must be new and unused. Equipment refers to all hardware, software, equipment, cabling, materials and incidentals etc.
21. Provide manufacturer's original box or shipping container from one (1) of every serialized.
22. All work shall be done in a thorough and conscientious manner according to industry standards and shall be subject to inspection and acceptance.
23. An appropriate construction schedule shall be developed by the Contractor and shall be subject to approval by the Owner's representatives. The construction schedule shall include at least one installation supervisor, or lead technician, for on-site management of the project.
24. Prior to starting the installation, the assigned installation supervisor, or lead technician, shall participate in a "walk-through" of the project location with the Owner's representatives to review the installation documentation, verify that all construction necessary for the installation has been completed, and verify all installation methods and cable routes.
25. The Contractor shall be responsible for completing a standardized report form addressing the weekly progress of the installation schedule.
26. The Contractor shall maintain conductor polarity identification at the main equipment room, backbone, and horizontal connections in accordance with industry practices.
27. The Contractor shall provide any necessary screws, anchors, clamps, tie wraps, distribution rings, power supplies, miscellaneous grounding and support hardware, etc., necessary to facilitate the installation of the system.
28. The Contractor shall coordinate all final power requirements, conduits, and conduit sleeves prior to rough in installation.
29. The Contractor shall be responsible for installation of proper grounding and bonding.
30. The Contractor shall be responsible for labeling all cable, distribution frames, and outlet locations, according to industry and Owner standards.
31. It shall be the responsibility of the installation Contractor to furnish any special installation equipment or tools necessary to properly complete the installation.
32. The Contractor shall not roll or store cable reels without an appropriate underlay.
33. The Contractor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.
34. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded at any time during the placement facilities. Failure to follow the appropriate guidelines may require the Contractor to provide additional material and labor necessary to properly rectify the situation. This shall also apply to any and all damages sustained to the cables by the installation Contractor during the implementation.
35. Materials shall be consistent throughout the building. Where two or more units of the same class of equipment are required, these units shall be the product of a single manufacturer and shall be the same product with the same material, model, and manufacturer number.
36. Wiring, materials, and equipment shall be delivered and stored in a clean dry space. They shall be properly packaged in factory fabricated type containers and protected from damaging fumes, construction debris and traffic until job completion.
37. All installation techniques and fixtures shall result in ease of maintenance and ready access to all components for testing measurements. All external screws, nuts, and locking washers shall be stainless steel. No self-tapping screws shall be used unless specifically approved by the Owner's representatives. All parts shall be made of corrosion resistant material, such as plastic, anodized aluminum or brass. All materials used in installation shall be resistant to fungus growth and moisture deterioration. An inert dielectric material shall separate dissimilar metals apt to corrode through electrolysis under the environmental operating conditions specified.
38. The Contractor shall submit for approval, a detailed description of the procedures and equipment included for the complete operational installation.

B. Control Systems

1. Contractor shall meet with Owner and whomever the Owner deems appropriate to discuss control features and navigation. Once agreement is received on the control navigation, the Contractor shall submit detailed documentation and GUI configuration and programming for approval. This process shall continue until Contractor obtains documented approval from the Owner for control design. Contractor shall provide reasonable hours for changes once the system is operational to ensure the Owner's satisfaction. The control software shall be delivered to the Owner upon substantial completion of the project.

C. Wiring Plan Requirements
1. Distribution of the cabling shall be accomplished through cable trays, conduit raceways, ducts, core-holes, extended columns, false half columns and plenums. Cabling shall be run at right angles from cable trays. Horizontal cable segments shall be placed in cable trays and with cable exits/entrances supported by distribution rings or J Hooks. Cable may not rest on ceiling tile, be supported on existing ducting, tied, or supported by fire alarm, security or electrical infrastructure nor interlaced with existing cable.
2. The Contractor shall be responsible for providing an approved ground at all equipment locations. The Contractor shall also be responsible for ensuring ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes, and frameworks. All grounds shall consist of a minimum of 12 AWG copper wire or larger as required by code and shall be supplied from an approved building ground and bonded to the main electrical ground.
3. Observe proper circuit and loudspeaker wiring polarity. Properly and clearly label connections and wires as to function and polarity. No cables shall be wired with polarity reversal between connectors, at either end. Take care when wiring microphone cables to ensure that constant polarity is maintained.
4. Contractor is responsible for coordinating final cable pathways and necessary conduit sleeves.
5. Minimum Specifications:
    a. All wire and cable shall be UL approved, meet all national, state, and local codes, and manufacturers recommendations for connected components for its intended application.
    b. Plenum Insulation shall be rated for a minimum of 300 volts and satisfy the Underwriters Laboratories (UL) listed fire rated cable insulation requirements in plenum areas.
    c. Cable runs shall be continuous runs. Mid-span cable splicing is not acceptable.
    d. Any pulling compound or lubricant used in cable installation shall not deteriorate the conductor or the insulation.
    e. Under carpet wiring and flat wiring shall not be used.
    f. Manufacturer's recommended cabling supersedes wire specified in this section.
    g. Contractor responsible for verifying all plenum rated spaces prior to installation. Provide Plenum rated cable as required.
    h. Contractor to verify and provide cabling that is applicable to its installed environment.
    i. All Pre-Amplifier audio cables shall be balanced unless otherwise noted.
6. HDBaseT AND AVoIP CABLES
    a. CAT6 or better
    b. Ensure that the cables pairs remain twisted together for canceling out Electromagnetic Interference (EMI) from the external sources are not exposed even partially, as it results in EMI issues.
    c. Use cables that are resistive to bend loss if excessive bending of cables cannot be prevented due to installation constraints.

D. Cable Management
1. The bend radius for twisted-pair cables is standardized at 12" (3" diameter).
2. Bundle cables within the guidelines of 2005 National Electrical Code (NEC) in Article 310.15(B)(2).
3. Avoid mounting the cabling components in places that block accessibility to other equipment (such as a power strip or fans) in and out of the racks.
4. Avoid

a. Applying extra twists.
b. Pulling or stretching beyond the specified pulling load rate.
c. Bending it beyond the specified bend radius, and not beyond 90º.
d. Creating tension in the suspension runs.
e. Stapling or applying pressure with the cable ties.

5. Avoid exposing cables to areas of condensation and direct sunlight.
6. Remove any abandoned cables, as they restrict the airflow, and contribute to the possible increase in the operational temperatures, which can affect the durability of the system.
7. The NEC (NFPA 70), Article 800.133 (2005 NEC) indicates the separation requirements. This section of the NEC specifies the following: Communication wires and cables shall be separated at least 50 mm (2 inches) from conductors of any electric, power, Class 1, non-power limited fire alarm, or medium-power network-powered broadband communication circuits. However, there are multiple exceptions to this generic rule, so refer to the NEC (NPFA 70) standard for more information.
8. All cabling shall have machine generated labels self-laminating. Handwritten labels shall not be accepted.
9. No cable ties shall be allowed on any low voltage cabling.

E. Rack Dressing
1. All Racks require Lacer Bars or Strips to provide clean cable management withing the rack.
2. All racks require the cable segregation of AC cables, Speaker Cables, low impedance balanced cabling and twisted pair cables.
3. No Cable Ties; Velcro only.

F. Identification, Labeling and Documentation
1. The Contractor shall label all termination devices, panels, enclosures, and equipment rooms. The Contractor shall mark each unit with permanently attached, self-laminating markings that shall not impair the equipment or present a hazard to maintenance personnel.
2. Place wire identification numbers on each end of all conductors. Install markers to be readable from left to right or top to bottom. Wire numbers shall be computer printed and self-laminating. Handwritten labels are not acceptable.
3. Mark all spare conductors and coil neatly located at the bottom of the equipment rack.
4. The contractor shall label power cables near the plug end. Label shall match equipment permanent label or function.

3.02 TESTING REQUIREMENTS

A. The Contractor shall perform sample tests in the presence of the Owner's representatives. Performing the testing procedures specified herein assures that the equipment and interconnection meets the performance characteristics specified. If testing indicates that the performance characteristics are not met, the test shall be declared a failure. The communication equipment and interconnection cabling shall be modified and/or repaired accordingly. The failed test and any other test that may be affected by the modification and/or repair shall be rerun. After all components have been installed, the integrity of the equipment and interconnection cabling shall be verified.

B. If a system test fails because of any component(s) in the system, the failed component(s) shall be corrected or substituted with other components and the tests shall be repeated. If a component has been modified because of the system test failure, a report shall be prepared and delivered to Owner's Representatives prior to retesting. The Contractor shall prepare and submit all test procedures and data forms for the post installation and system test to the Owner's representatives.

C. The test report shall contain the description of all tests performed, the results obtained, and any required adjustments or modifications necessary because of testing and installation. This report shall reflect the as-built communication equipment and interconnection cabling. An authorized representative of the Contractor shall sign the test report. At least three copies of the test report shall be sent to the Owner's representatives prior to scheduling of Final Observations.
1. Sample Test Report:

ITEM	ROOM/AREA	INPUT / OUTPUT	SOURCE	TEST RESULT	RECOMMENDED CORRECTIVE ACTION
1	Cafeteria Stage	AV-01 HDMI IN	Tech Laptop	No image displayed.	Verify HDBaseT connectivity on 12/25/19.

D. The test procedures shall have the Owner's representative's approval before the tests.

E. Contractor shall demonstrate to the Owner's representatives that the equipment operates as specified and that the tests meet performance requirements.

F. The Contractor shall ensure that the equipment is in first-class working condition and free of short circuits, ground loops, parasitic oscillations, excessive hum, RF interference, or instability of any form.

G. The Contractor shall test each operational component and adjust for equal sound levels at a given volume setting and replace defective items.

H. Contractor shall ensure that all loudspeaker and distributed audio systems described herein are balanced and optimized for maximum quality sound and coverage of listening areas.

3.03 TRAINING

A. Owner and end user training shall be videotaped and provided to the Owner as project closeout documentation.

B. System training shall be provided for the operator/user and technical staff in separate training meetings.
   1. Owner and end user training shall be held at Owner's convenience and to the Owner's satisfaction.
   2. Technical operation and maintenance training shall be held at Owner's convenience and to the Owner's satisfaction.
   3. The Contractor shall provide documentation demonstrating the Owner and/or Owner's Representatives understand the operation and maintenance of the system.

C. Complete operation and maintenance manuals and preliminary as-built drawings shall be delivered to the Owner one week prior to training sessions.

D. Operator/user training shall minimally consist of:
   1. Provide printed reference material for each trainee that documents and explains in layman's terms:
      a. System block diagram
      b. Normal day-to-day operation
      c. Operator selectable features
   2. Provide a hands-on training with Q & A session.

E. Technical Operations and Maintenance training shall consist of :
   1. The technical explanation shall be sufficiently thorough that staff personnel shall be able to make any programming changes required, analyze malfunctions and make equipment substitutions or bypasses necessary to maintain system operation except for the malfunctioning equipment or circuits.
   2. Provide printed reference material for each trainee that documents and explains in technical terms :
      a. System block diagram with technical features
      b. Technical operation, adjustments and programming
      c. System features and programming
      d. Review of as-built drawings.
   3. Provide a hands-on training with Q & A session.

F. Contractor shall provide a complete and comprehensive list of the maintenance schedule for all installed and/or provided equipment. The list shall be provided in both printed and Adobe Acrobat formats.

3.04 ACCEPTANCE OF SYSTEMS

A. Specifications set forth for construction of the system have been devised to ensure system compatibility and performance. Compliance with these Specifications shall be determined during periodic observations of construction. Repeated failure to comply with the specification shall be considered before the initial acceptance phase of the plant commences.

B. Prior to the Contractor performing final testing, deliver preliminary as-build documents and system testing documentation to Owner for use in conducting testing observation.

C. Once accepted by the Architect and Owner all documentation / program code becomes the property of the Owner.

D. Within ten days of receipt of the final acceptance notice, the Owner's representatives shall schedule and perform the final inspection. When the work is found acceptable under the contract documents and the contract is fully performed, declare substantial completion of the project.

END OF SECTION

SECTION 11 6623
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basketball backboards, goals, and support framing.

B. Floor sleeves for net and goal posts.

C. Wall mounted protection pads.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete floor slab to receive floor sleeves and anchors.

B. Section 05 1200 - Structural Steel Framing: Structural members supporting basketball systems.

C. Section 05 5000 - Metal Fabrications: Secondary structural members supporting gymnasium equipment.

D. Section 09 6466 - Wood Athletic Flooring

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 101 - Life Safety Code; 2017.

E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.

1.05 SUBMITTALS

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

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Structural steel welder certifications.
   3. Manufacturer's installation instructions.

C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gage of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.

D. Erection Drawings: Detailed dimensional requirements for proper location of equipment and court layouts.

E. Submit a copy of the latest UIL rules and regulations verifying compliance

F. Samples: Submit samples of manufacturer's available range of colors, textures, and graphics. Accompanying the submittal described above, submit Samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used

G. Operating and maintenance data, for each operating equipment item.

H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 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 work of the type specified with minimum three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Backboard and goal shall have a life-time replacement warranty against breakage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gymnasium Equipment:
   1. AALCO Manufacturing Company; www.aalcomfg.com.
   2. ADP Lemco, Inc.; www.adplemco.com.
   3. Arizona Courtlines, Inc; www.arizonacourtlines.com.
   4. Draper, Inc: www.draperinc.com/sle.
   5. Performance Sports Systems: www.perfsports.com.
   6. Porter Athletic Equipment Company: www.porterathletic.com.
   7. Sports Imports: www.sportsimports.com
   8. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GENERAL REQUIREMENTS

A. All equipment model numbers equal to Porter Equipment Co.

B. See drawings for sizes and locations, unless noted otherwise.

C. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:
   1. National Federation of State High School Associations (NFHS) sports rules.
   2. United States Olympic association rules for the sport.

D. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.

E. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

F. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.

G. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.03 BASKETBALL

A. Ceiling-Suspended Backstop Assemblies:
   1. Framing: Center strut; forward folding; rear braced framing
      a. Main Court; model 90917-28
      b. Side Court; model 90917-28
   2. Folding Control System: Electric hoist; Provide each retractable backstop with a model 706 1/2 H.P. for backstops under 28' or model 707 ¾ H.P. winch on backstops 28' & over. Winch and safety strap model 797 and key switch model 791. Refer to Section 08 7100 – Door Hardware for key cylinder.
   3. Height Adjuster: Each backstop shall be provided with line height adjustment unit model 900 to raise/lower assembly by 2 feet to adjust goal height from 8'-0" to 10'-0" A.F.F..
   4. Framing Color: Manufacturer's standard.

B. Backboards: Model 00208-300, 1/2" Tempered glass, rectangular shaped.
   1. Frame: Brushed aluminum edge, steel mounting.
   2. Dimensions: 42 inches high by 72 inches wide
   3. Markings: Integrally manufactured.
   4. Provide model 00-326 safety padding for bottom edge of backboard.
   5. Provide mounting kit.
   6. Color: As selected from manufacturer's standard selection.

C. Goals: Model 00252-500 steel rim, mounted to backboard, with attached nylon anti-whip net; complete with mounting hardware.
   1. Net Attachment Device: Tube-tie.
   2. Finish: Powder coat orange.

2.04 FLOOR-MOUNTED EQUIPMENT

A. Floor Sleeves for Posts: Metal sleeve, with latch cover, cast into concrete subfloor to hold poles for volleyball nets; installed flush with finish floor surface.
   1. Latch Cover: Brass, round; tamper resistant lock with key.
   2. Sleeve: Steel.
   3. Round Pole Diameter: 3 1/2 inches.
   4. Depth of Sleeve: 9 inches from floor surface to bottom, including latch cover.
   5. Locate as shown on the drawings;
      a. At synthetic gymnasium floors provide model 00875-200

2.05 WALL PADDING

A. Wall Padding: Model 00570-1 with foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
   1. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84 as a complete panel.
   2. Flammability: Comply with NFPA 286.
   3. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board
      a. Color: As selected from manufacturer's standard range.
      b. Texture: Embossed leather-look.
      c. Fabric Weight: 14 oz/sq yd.
   4. Foam: Open cell polychloroprene (Neoprene) 6 pcf nominal density.
   5. Foam Thickness: 2 inches.
   6. Backing Board: Oriented strand board.
      a. Thickness: 7/16 inch.

b. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84.

7. Panel Dimensions: 24 inches wide by 70 inches long, no nailing margins.
8. Mounting: Removable; Model 00347-100 and 00347-300 mounting hardware. Set wall pads 2" above floor elevation

B. Specially Shaped Padding: Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:
1. Wall corners.
2. Hand Rail and Guard Rail

C. Round Column Padding: Same construction as standard padding; made to fit; with grommet strip on each long side of pad, provide laces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.

C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.

D. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

A. Install in accordance with Contract Documents and manufacturer's instructions.

B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

C. Install equipment rigid, straight, plumb, and level.

D. Secure equipment with manufacturer's recommended anchoring devices.

E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

F. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

A. Verify proper placement of equipment.

B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.

C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration; lubricate equipment as recommended by manufacturer.

3.04 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 11 6813
PLAYGROUND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Playground equipment.

B. Playground equipment schedule

1.02 RELATED REQUIREMENTS

A. Section 32 1816 - Poured-in-Place Safety Surfacing

1.03 REFERENCE STANDARDS

A. ASTM F1487-07 - Standard consumer performance specification for playground equipment for public use.

B. CPSC Handbook for Public Playground Safety, publication number 325.

C. CSA Z614-07

D. All manufactured components must be IPEMA certified, International Playground Equipment Manufacturers Association.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Convene a meeting one week before starting earthwork for playground to discuss coordination between various installers.
   1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
   2. Include representatives of Contractor.
   3. Notify Architect at least 2 weeks prior to meeting.

1.05 SUBMITTALS

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

B. Product Data: For all manufactured equipment, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, safety limitations, and the number of users permitted.
   1. Certifications: Provide International Play Equipment Manufacturers Association (IPEMA) certification that product complies with ASTM F1487, excluding section 10 and 12.6.1.

C. Product Data: For fabricated items, provide the following:

D. Shop Drawings: Detailed scale drawings showing play event layout, Use Zone perimeters, and fall height for each play event.
   1. Show locations and dimensions of footings and anchorage points.
   2. Clearly identify mounting elevations in relation to a fixed survey point on site and to subgrade elevation and depth of protective surfacing, furnishings, and plantings.

E. Samples: For each item for which color must be selected provide color chart showing full range of colors and finishes.

F. Maintenance Data: Provide manufacturer's recommended maintenance instructions and list of replaceable parts for each equipment item, with address and phone number of source of supply.

G. Manufacturer's Field Report.

H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Equipment and Design Qualifications:
   1. All playground equipment shall comply will all the requirements of CPSC, ASTM, ADA and will be IPEMA certified.
   2. All safety fall zones shall be determined in accordance with ASTM 1487-07 and CPSC Handbook for Public Playground Safety Publication number 325. All playground equipment designs shall be evaluated and signed off by a NPSI certified playground inspector.

B. Manufacturer Qualifications:
   1. The manufacturer of the playground equipment must carry a minimum of 10 million dollars of liability insurance with an AM best rating. The manufacturer of the playground equipment must have a minimum of 10 years experience in manufacturing commercial playground equipment.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store equipment to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year warranty for playground equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURER:

A. Basis of Design: Equipment and components are based on products as manufactured by Lea Park & Play, Inc.: www.leaparkandplay.com

B. Other Approved Approved Manufacturers:
   1. Child's Play, Inc.: www.childsplayinc.net
   2. PlayPower, Inc.: www.playpower.com.
   3. Kompan Inc.: www.kompan.us
   4. Miracle Recreation Equipment Company: www.miracle-recreation.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PLAYGROUND EQUIPMENT SCHEDULE:

Part Number	Description
200006956	PLATE TRANSITION KB
200006959	BRACKET DECK TO POST KB
200006975	SLIDE DBL. W.D. 915 MM /36" KB
200007096	PANEL COUNTER KB
200008193	TOOL BOX KID BUILDERS #2, S.S. (MM)
200013800	KB 136" POST PLUS GLV. W/ALUM.CAP
200013805	KB 8' POST PLUS GLV.W/ALUM.CAP
200013812	KB 148" POST PLUS GLV. W/ALUM.CAP
200013920	LOOP ASSY HAND-HOLD KB
200013924	LOOP ASSY SAFETY KB
200015483	KB 164" POST PLUS GLV. W/ALUM.CAP
200072378	KBP MESH HEX ROOF (2001)

200111492	LABEL, IDENTIFICATION STAMPED W/RIVETS
200131014	KB 172" GALV. POST WITH ALUM. CAP
200200073	KB PANEL ARCH "SIGN LANGUAGE" DKMT
200200100	BRIDGE 90DEG. KB 8' W/SAFETY RAILS
200200185	DECK BALCONY KB SMALL HOLE
200200189	KB DK/DK PLATE 16"/405MM (FACES)
200200385	RAMP 2440MM W/GUARD RAILS KB(SMALL HOLE
200200391	KB CATWALK (SMALL HOLES)
200200401	STEPS DK/DK 610MM W/SFTY RLS F/KB SMLHL
200200402	STEPS DK/DK 815MM W/SFTY RAILS KB SMLHL
200200504	PANEL REACH MELODY MAKER F/KB
200200506	PANEL REACH GEAR F/KB
200200530	KIT MAINTENANCE KB W/PAINT W/O LIST
200200687	POST PLUS 200" W/ALUM CAP F/KB
200201023	SLIDE WAVE KB 812 MM/32"
200202135	KB INFNTY HI-CLMB 64"(1625 MM)LG DK EDGE
200202202	MAXPLAY 8' STANDARD BEAM
200202204	MAXPLAY 8' ADD-ON STANDARD BEAM
200202304	KB HANG OUT
200202398	KB RECYCLED TREEHOUSE WINDOW PANEL
200202462	KB RECYCLED TREEHOUSE SNAKE POLE 96"
200202472	KB RECYCLED TREEHOUSE POD CLIMBER 96"
200202497	KB DECK HEX SMALL HOLE 11GA
200202501	KB DECK 1/2 SQUARE SMALL HOLE 11GA
200202503	KB DECK SQUARE SMALL HOLE 11GA
200202510	KB MORPHOUS SLIDE 2440MM(96") LEFT
200202559	KB TRANS STAT 1016 SFTY RL (SM HL)11GA
200202720	NU-EDGE STUMP PINE SHORT F/KB
200202721	NU-EDGE STUMP BIRCH MEDIUM F/KB
200202730	NU-EDGE TREE 64" W/KB TREEHOUSE PANEL
200202742	NU-EDGE LOG SLICE CLIMB 1020MM(40") F/KB
200202750	KB NU-EDGE CURVED ROOF
200202760	KB NU-EDGE BEAM ROOF

200202781	NU-EDGE ARCH LOG CLIMB 1020MM(40") F/KB
200202835	ASSY BELT SEAT F/8' SWING W/CHAIN
200203131	KB QUANTUM II SLIDE 8' SPIRAL RIGHT
200203394	KB SPINFINITY STANDING 72" REQ
200203433	INCLUSIVE SWING SEAT W/CHAINS 8'
200203470	KB ACTIVITY PANEL FRAME DKMT
200203478	ACTIVITY PANEL FOUR-THE-WIN INSERT
200203480	ACTIVITY PANEL SLIDE & SOLVE INSERT
200203509	KB Elev Transfer Deck W/Rails
200203609	QUIET GROVE
200305597	14' LARGE CRATE (ASSY DOMESTIC)
787Z	RISK MANAGEMENT SIGN - ENGLISH
925603	LABEL P/C (5 TO 12 YRS) PPLT
925960	THUMB DRIVE 2GB - PPLT
926020	LITTLE TIKES CARD F/THUMB DRIVE
HW7704-1	HRDW PKG F/CLAMP ELIMINATION S1/1
INSTALL BOOK	INSTALL BOOK FOR PP ORDERS

2.03 GENERAL EQUIPMENT:

A. Plastic Caps shall fit snugly into 127 mm (5") and 33 mm (1.315") tube ends and shall be injection molded Low Density Polyethylene. This plastic shall be stabilized against ultraviolet (UV) degradation and shall have color molded in. All caps will be installed at the factory and 127 mm (5”) caps will be secured with aluminum hammer drive pins.

B. Aluminum Caps shall fit snugly into 127 mm (5") tube ends. The Aluminum cap shall be made from SAE 413 aluminum with a minimum wall thickness of 4 mm. Prior to insertion into the post, all caps shall be painted per PPLT PAINT Specification. All caps will be installed at the factory and 127 mm (5”) caps will be secured with aluminum hammer drive pins.

C. PPLT PAINT Specification: Primer shall be electrostatically applied and cured in an infrared oven. Paint shall be an electrostatically applied polyester TGIC (triglycidyl isocyanurate) powder coating which shall be cured at temperatures between 400 and 500 degrees Fahrenheit. The thickness of the combined primer/paint shall be between 5 mils and 11 mils. The polyester powder shall comply with ASTM standards: D-2794 (Impact Resistance Test), B-117 (Salt Spray Resistance Test), G26 (Weatherability Test), and D3359B (Adhesion Crosshatching Test).

D. PlayPower Operations ROTO Specification: Rotationally Molded Plastic Parts shall be molded from linear low density polyethylene with ultraviolet (UV) light stabilizers, anti-static guard (for Molding purposes) and color molded in. This material shall comply with ASTM-D-790 (Flex Modulus), ASTM -D-638 (Tensile Strength), ASTM-D-648 (Heat Deflection Temperature), ARM-STD (Low Temperature Impact) and rated UL 94.

E. PPLT PVC Specification: Textured Poly-Vinyl-Chloride coating shall be an average of 3 mm (.125”) thick. Poly-vinyl-chloride coating shall be oven cured and textured for added traction when wet or dry.

F. Hardware: Bolts, Nuts, Screws, Threaded Spacers, Washers and Other Hardware used in the assembly of components shall be metric stainless steel and tamper resistant. All necessary hardware shall be provided.

G. Deck Clamp assemblies shall consist of two steel half-clamps. Clamp profiles shall be designed to eliminate protrusions. Clamps shall be die formed from 12 gauge HRPO steel. Clamps shall have a 6 mm (.25") radius rib formed in the top and bottom of the clamp for structural integrity. The clamp attachment bracket shall be formed from 11 gauge sheet steel and shall be welded securely to the clamp half. All clamp halves shall be zinc plated, yellow dichromate coated and phosphate coated before being TGIC (triglycidyl isocyanurate) polyester powder coated. Tamper-resistant fasteners shall be used to retain clamps and shall consist of M10 six lobe socket head stainless steel cap screws and M10 slab-base Tee nuts. All clamps shall be provided with aluminum hammer drive pins to protect against slippage.

H. Rail Clamp assemblies shall consist of two steel half-clamps. Clamp profiles shall be designed to eliminate protrusions. Clamps shall be die formed from 12 gauge HRPO steel. Clamps shall have a minimum 6 mm (.25") radius rib formed in the top and bottom of the clamp for structural integrity. All clamp halves shall be zinc plated, yellow dichromate coated and phosphate coated before being TGIC (triglycidyl isocyanurate) polyester powder coated. Tamper-resistant fasteners shall be used to retain clamps and shall consist of M10 six lobe socket head stainless steel cap screws and M10 slab-base Tee nuts. All clamps shall be provided with aluminum hammer drive pins to protect against slippage.

I. Wing and Panel Clamp assemblies shall consist of two steel half-clamps. Clamp profiles shall be designed to eliminate protrusions. Clamps shall be die formed from 12 gauge HRPO steel. Clamps shall have a 6 mm (.25") radius rib formed in the top and bottom of the clamp for structural integrity. The clamp wing bracket shall be formed from 7 gauge sheet steel and shall be welded securely to the clamp half. All clamp halves shall be zinc plated, yellow dichromate coated and phosphate coated before being TGIC (triglycidyl isocyanurate) polyester powder coated. Tamper-resistant fasteners shall be used to retain clamps and shall consist of M10 six lobe socket head stainless steel cap screws and M10 slab-base Tee nuts. All clamps shall be provided with aluminum hammer drive pins to protect against slippage.

J. All Steel Tube Components shall comply with ASTM standards: A-500, Or A-513. The steel tube components contain five layers including an inside galvanized coating, high tensile strength cold formed steel, hot dipped pure zinc meeting ASTM B-6 applied at 3.5 tenths of an once per square foot, and a proprietary conversion and advanced polymer coatings. The components are freed of excess weld spatter and shall be cleaned in a multiple bath system which shall include a rust-inhibitive iron phosphate wash prior to painting. Exceptions: 127 mm (5") O.D. aluminum posts.

K. Brackets shall be fabricated from punched and formed 4.5 mm pre-galvanized sheet steel.

L. Gaskets shall be rubber injection molded from ultraviolet (U.V.) protected synthetic rubber. Rubber gaskets shall provide an aesthetic seal around the wonder fastener and bracket.

M. Footing for 127 mm (5") diameter upright posts shall be 305 mm (12") diameter x 940 mm (37") depth. Galvanized steel posts shall be 127 mm (5") O.D., 11 gauge pre-galvanized round tubing. Minimum tensile strength shall be 330MPa (48,000 psi). Minimum yield point shall be 310MPa (45,000 psi). The bottom portion of all upright posts shall be crimped slightly

2.04 PLAYGROUND COMPONENTS:

A. Standard Belt Swing Seats shall be heavy duty construction, fabricated from 70 durometer EPDM rubber with a tempered steel insert molded inside, rendering them slash proof

B. GAUGE GALVANIZED STEEL POST shall be 127 mm (5") O.D., 11 gauge pre-galvanized round tubing. Minimum tensile strength shall be 330MPa (48,000 psi). Minimum yield point shall be 310MPa (45,000 psi). Plastic caps shall fit into the uncrimped end of the 127 mm (5") tube. After fabrication, all posts shall be painted per PPLT PAINT Specification.

C. GAUGE GALVANIZED STEEL POST shall be 127 mm (5") O.D., 11 gauge pre-galvanized round tubing. Minimum tensile strength shall be 330MPa (48,000 psi). Minimum yield point shall be 310MPa (45,000 psi). Plastic caps shall fit into the uncrimped end of the 127 mm (5") tube. After fabrication, all posts shall be painted per PPLT PAINT Specification.

D. 90 DEGREE AND "S" BRIDGE WITH SAFETY RAILS shall be a minimum of 915 mm (36") wide. Bridges shall be fabricated from laser cut 11 gauge steel with 76 mm (3") formed sides. Bridge assemblies shall be vinyl dipped per PPLT PVC Specification. Safety Rails vertical rungs shall be fabricated from 25 mm (1") pre-galvanized steel tubing. The horizontal rails shall be fabricated from 33 mm (1.315") pre-galvanized steel tubing. Safety rails shall provide an enclosure, and shall have no gaps greater than 80 mm (3.15") and less than 254 mm (10"), especially between vertical rungs and posts. Safety rails shall be painted per PPLT PAINT Specifications.

E. BALCONY VINYL CLAD METAL DECK shall cover a minimum of .365 square meters (567 square inches) of top surface area and be designed to maintain a full 1.2 m (48") on center post spacing. Construction shall consist of one semi circle shaped deck. Metal decks shall be fabricated from 13 gauge hot rolled steel, which shall be punched, formed and reinforced with welded in place 11 gauge strips. Deck shall have a pattern of equally spaced holes on one edge to provide flush mounting to the deck. This assembly shall be coated per PPLT PVC Specification. Balcony Rails provide full enclosure and shall be fabricated from 33 mm (1.315") O.D. pre-galvanized steel tubing. Rails shall be painted per PPLT PAINT Specification.

F. CAT WALK shall be manufactured from 3 mm (11 gauge) sheet steel with 3 mm (11 gauge) steel sides and end supports. Cat Walk shall be dipped per PPLT PVC Specification. Cat Walk shall have a dual rail side enclosure. Top and bottom rails shall be fabricated from 42.2 mm (1.625") O.D. pre-galvanized steel tubing with vertical rails welded to the top and bottom rail. Vertical rails shall be fabricated from 25 mm (1") O.D. pre-galvanized steel tubing. End sections shall be fabricated from 33 mm (1.315") O.D. pre-galvanized steel tubing, with 3 mm (11 gauge) sheet steel end plates. After assembly side enclosures and end sections shall be painted per PPLT PAINT Specification.

G. COLORED KICK PLATES AND DECK TO DECK ACTIVITY PLATES shall be fabricated from 13 gauge (2.3 mm) pre-galvanized sheet steel for the 8", 12", and 16", 24", 28", and 32" plain models. Models with slots or Parachutes (24", 28", 32") shall be fabricated from 11 gauge (3.0 mm) pre-galvanized sheet steel. After fabrication, deck to deck plates shall be painted per PPLT PAINT Specification. 8", 12" and 16" plates shall have fun faces laser cut into them. 24", 28" and 32" plates shall have grooves cut into them with optional slider "Parachute/shapes" fabricated from CNC Routed high density polyethylene sheet.

H. DECK EDGE SIMULATOR for metal decks shall be fabricated from 11 & 7 gauge pre-galvanized sheet steel. Welded assembly shall be painted per PPLT PAINT Specification.

I. DECK TO DECK STEPS WITH SAFETY RAIL shall consist of welded tread, riser and stringer sections fabricated from 13 gauge hot rolled steel. This assembly shall be coated per PPLT PVC Specification. Safety Rails shall be fabricated from 33 mm (1.315") O.D. and 3/4" X 1" FSO pre-galvanized tubing. Safety rails shall provide an enclosure and shall have no gaps greater than 80 mm (3.15") and less than 254 mm (10"), especially between vertical rungs and posts. Safety Rails to be painted per PPLT PAINT Specification.

J. DECK TO GROUND TRANSITION PLATE shall be fabricated from 7 gauge hot rolled steel. This assembly shall be coated per PPLT PVC Specification

K. DOUBLE WIDE SLIDE WITH HOOD shall be rotationally molded per PPLT ROTO Specification. Plastic double wide slide sides shall be 203 mm (8") high from the slide surface and slide bed way shall be designed with a 406 mm (16") minimum width. Double wide slide shall be a one-piece design with a center divider having no seams, joints or gaps. Slide end support shall be fabricated from 38 mm (1.5") square tubing. Mid support shall be fabricated from 60.3 mm (2.37") O.D. tubing. All steel tubing shall be painted per PPLT PAINT Specification.

L. FULL-HEX VINYL CLAD METAL DECK shall cover a minimum of 3.78 square meters (5,900 square inches) of top surface area and be designed to maintain a full 1.2 m (48") on center post spacing. Construction shall consist of two half-hex shaped decks assembled together during installation. Metal decks shall be fabricated from 11 gauge hot rolled steel which shall be punched, formed and reinforced with welded in place 11 gauge strips and 7 gauge corner plates. Decks shall have a pattern of equally spaced holes on each edge to provide flush mounting of play events that attach to the deck. This hole pattern shall allow multiple decks at the same level to be assembled providing a surface without size limitations. This assembly shall be coated per PPLT PVC Specification.

M. HAND HOLD LOOP shall be fabricated from 33 mm (1.315") O.D. pre-galvanized steel tubing and shall be painted per PPLT PAINT Specification.

N. Identification label shall be fabricated from alluminum sheet .016" (4 mm) thick and attached with aluminum pop rivets.

O. KB Activity Panel Frame shall be fabricated from routed 19 mm (3/4") high density polyethylene. Deck plates shall be pre-galvanized 3.0 mm (.12") 11 gauge sheet steel. Hardware used shall be stainless steel and tamper resistant. All steel shall be painted per PPLT PAINT Specification.

P. KB Hangout Frame shall be constructed from 48.3mm [1 7/8"] O.D. pre-galvanized tubing welded to 4.5mm [7ga.] galvanized sheet steel. All steel components shall be painted per PPLT PAINT Specification. Seats shall be rotationally molded per PPLT ROTO Specification.

PART 3 - EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that playground area has been graded to subgrade elevations required and that excess soil, rocks, and debris have been removed.

B. Verify that playground equipment footings have been installed in proper locations and at proper elevations.

C. Verify location of underground utilities and facilities in playground area; damage to underground utilities and facilities will be repaired at Contractor's expense.

3.02 PREPARATION

A. Stake location of playground elements, including Use Zone perimeters, perimeter of protective surfacing, access and egress points, hard surfaces, walls, fences, and structures, and planting locations.

B. Stake layout of entire Use Zone perimeter before starting any work and before subbase under resilient surfacing is laid.
   1. Verify that Use Zone perimeters do not overlap hard surfaces, whether currently installed or not.
   2. Verify that Use Zones are free of obstructions that would extend into the resilient portion of the protective surfacing.
   3. If conflicts or obstructions exist, notify Architect.
   4. Do not proceed until revised drawings have been provided, showing corrected layout, and obstructions have been removed.

3.03 INSTALLATION

A. Coordinate work with preparation for and installation of protective surfacing as shown in the contract documents. The resilient portion of the protective surfacing is to be installed after playground equipment installation.

B. Install concrete footings with top surface a minimum of 1/2 inch below required subgrade elevation.

C. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).

D. Anchor equipment securely below the bottom elevation of the resilient surfacing layer.

E. Install without sharp points, edges, or protrusions; entanglement hazards; or pinch, crush, or shear points.

F. Do not modify play events on site without written approval of manufacturer.

G. Install required signage if not factory-installed.

3.04 FIELD QUALITY CONTROL

A. Obtain the services of the equipment manufacturer's field representative to review the finished installation for compliance with specified requirements and with design criteria to the extent known to the Contractor; submit report of field review.

B. Owner or Owner's representative will inspect playground equipment after installation to verify that playground meets specified design safety and accessibility requirements.

C. Repair or replace rejected work until compliance is achieved.

3.05 CLEANING

A. Restore adjacent existing areas that have been damaged from the construction.

B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation. Clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.

C. Clean playground area of excess construction materials, debris, and waste.

D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction.

3.06 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 2400
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Window shades and accessories.

B. Electric motor operators.

C. Motor controls.

1.02 REFERENCE STANDARDS

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

B. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of all affected installers.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken.
   2. Do not install shades until final surface finishes and painting are complete.

1.04 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Motorized Shades: Include power requirements and standard wiring diagrams.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

E. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

F. Selection Samples: Include fabric samples in full range of available colors and patterns.

G. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

H. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Project Record Documents: Record actual locations of control systems and show interconnecting wiring.

J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

K. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience.
   1. Factory training and demonstrated experience.

1.06 MOCK-UP

A. Mock-Up: Provide full size mock-up of window shade complete with selected shade fabric including sample of seam when applicable.
   1. Obtain Architect's approval of light and privacy characteristics of fabric prior to fabrication.
   2. Full-sized mock-up may become part of the final installation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Roller Shade Hardware, Chain and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.
   2. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.
   3. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manually Operated Roller Shades:
   1. MechoShade System, Inc.: www.mechoshade.com
   2. Draper, Inc: www.draperinc.com/sle.
   3. Lutron Electronics Co., Inc: www.lutron.com/sle.
   4. Hunter Douglas: www.hunterdouglas.com.
   5. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Motorized Roller Shades, Motors and Motor Controls:
   1. MechoShade System, Inc.: www.mechoshade.com
   2. Draper, Inc: www.draperinc.com/sle.
   3. Hunter Douglas: www.hunterdouglas.com.
   4. Lutron Electronics Co., Inc: www.lutron.com.
   5. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com.
   6. Substitutions: See Section 01 6000 - Product Requirements.

C. Basis of Design: Motorized Shade System
   1. MechoShade System, Inc.: Electro Shade System, Electro/2

D. Basis of Design: Manual Shade System
   1. MechoShade System, Inc.: Mecho SlimLine

E. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 WINDOW SHADE APPLICATIONS

A. Shades: Translucent shades.
   1. Type: Roller shades.
      a. Fabric/Color: Refer to Section 01 6210 - Schedule of Materials and Colors.
   2. Mounting: Inside (between jambs).
   3. Operation: Manual and motorized, in locations indicated.

2.03 ROLLER SHADES

A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories.
   1. Size: As indicated on drawings.

B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Translucent Shades: Soften the light and reveal only shadow-like outlines to the outside; substantial privacy; Openness Factor 0-1 percent unless otherwise noted.
   2. Flammability: Pass NFPA 701 large and small tests.

C. Roller Tubes: As required for type of operation.
   1. Size: Manufacturer's standard, selected for suitability for installation conditions, span, and weight of shades.

D. Hembars: Designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.
   1. Style: Full wrap fabric covered bottom bar, flat profile with closed ends.

E. Manual Operation: Clutch operated continuous loop; beaded ball chain.

F. Motor Operation: Motor system housed inside roller tube, controlling shade movement via motor controls indicated; listed to UL 325.
   1. Audible Noise: Maximum 39 dBA measured 3 feet from the motor unit; no audible clicks when motor starts and stops.
   2. Motors: Size and configuration as recommended by manufacturer for the type, size, and arrangement of shades to be operated; integrated into shade operating components and concealed from view.
   3. Motor Type: AC, for direct hardwired connection to AC power source.
   4. Coupling of Multiple Shades: Where possible, minimize number of motors by coupling adjacent shades.
   5. Control Compatibility: Fully compatible with the controls to be installed.

2.04 MOTOR CONTROLS

A. Motorized shades to be controlled by wall-mounted controls as specified below.

B. Control Requirements:
   1. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.
   2. Capable of controlling shade speed for tracking within plus or minus 0.125 inch throughout entire travel.
   3. Capable of stopping within accuracy of 0.125 inch at any point between open and close limits.
   4. Capable of assigning shades to groups and subgroups without rewiring.
   5. Capable of storing programmable stop points, including open, close, and any other position.

6. Provide power failure memory for preset stops, open and close limits, shade grouping and subgrouping and system configuration.
7. Capable of synchronizing multiple units of the same size to start, stop and move in unison.
8. Provide all components and connections necessary to interface with other systems as indicated.

C. Wall-Mounted Controls: UV stabilized visible parts meeting {\rs\#1}; provided by shade manufacturer.

2.05 ACCESSORIES

A. Fascias: Size as required to conceal shade mounting.
1. Style: As selected by Architect from shade manufacturer's full selection.
2. Material and Color: To match shade.

B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.

C. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.06 FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Fabricate shades to fit openings within specified tolerances.
1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window sill.
2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Installation Tolerances:
1. Inside Mounting: Maximum space between shade and jamb when closed of 1/16 inch.
2. Maximum Offset From Level: 1/16 inch.

C. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

D. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.06 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.07 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 12 3200
MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured custom plastic-laminate-faced casework, with cabinet hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and nailers for anchoring casework.

B. Section 07 9200 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

C. Section 12 3600 - Countertops: Additional requirements for countertops.

1.03 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.04 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

B. ANSI A208.1 - American National Standard for Particleboard; 2016.

C. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2016.

D. ASTM C1036 - Standard Specification for Flat Glass; 2016.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

F. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

G. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting at least one week prior to the start of the work of this section; require attendance by all affected installers.

B. Keying Conference: Conduct conference prior to ordering keys. Incorporate conference decisions into keying submittal.

1.06 SUBMITTALS

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

B. Product Data: Component dimensions, configurations, construction details, joint details, attachments and hardware.

C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors, reinforcements, and blocking, placement dimensions and tolerances, clearances required, and keying information.

D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 6 inches by 6 inches or as indicated.
   1. Plastic laminate samples, for color, texture, and finish selection, size 6 inches by 6 inches.

E. Samples for Hardware Selection: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Maintenance Data: Manufacturer's recommendations for care and cleaning.

I. Finish touch-up kit for each type and color of materials provided.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience and one project within the last 5 years with a value of woodwork within 20 percent of cost of woodwork for this project.

B. Perform cabinet construction in accordance with AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than five years of documented experience and approved by manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:
   1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:
   1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.09 MOCK-UP

A. Provide full size base cabinet, upper cabinet, and tall cabinet complete with drawers, door, adjustable shelf and countertop.

B. See Section 01 4000 - Quality Requirements for additional requirements.

C. Locate where directed by the Architect.

D. Mock-up may remain as part of the Work.

1.10 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, at no additional cost to Owner. Defects include, but are not limited to:
   1. Ruptured, cracked, or stained finish coating.
   2. Discoloration or lack of finish integrity.
   3. Cracking or peeling of finish.
   4. Delamination of components.
   5. Failure of adhesives.

6. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer shall be members in good standing of the Architectural Woodwork Institute (AWI/AWMAC/WI).

B. Obtain casework from single source and manufacturer, unless otherwise indicated.

2.02 CASEWORK, GENERAL

A. Quality Standard: AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Types: When more than one type is required, see drawings for location of each type of casework.

C. Plastic Laminate Faced Cabinets: Custom Grade.

D. Desks and Display Cases - Premium Grade

E. Refer to 01 6210- Schedule of Materials and Colors and Drawings for additional casework details.

2.03 LUMBER MATERIALS

A. Hardwood Lumber: NHLA; Graded in accordance with AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, Grade II/Custom; average moisture content of 6-8 percent; species as scheduled.

B. Solid Lumber: Any Species, with no defects affecting strength or utility.

2.04 PANEL MATERIALS

A. Plastic-laminate-faced Plywood for Non-Decorative Purposes: NIST PS 1, Interior rated adhesives, core of wood plies from any species suitable for intended use unless otherwise indicated, thickness as indicated or as required by application.
   1. Provide 1" thick shelves at storage/book rooms.
   2. Provide 1" thick shelves when length is 36" or longer.

B. Particleboard: ANSI A208.1; medium density industrial type, minimum 45 lb./cu. ft. density, Grade 1-M-2 or better, as specified in AWI/AWMAC/WI (AWS), composed of wood chips bonded with manufacturer's recommended adhesive under heat and pressure; sanded faces; thickness as required; use for components indicated on drawings.

C. Medium Density Fiberboard (MDF): ANSI A208.2 ; type as specified in AWI/AWMAC/WI (AWS); composed of wood fibers pressure bonded with manufacturer's recommended adhesive to suit application; sanded faces; thickness as required.
   1. Use for door and drawer fronts.
   2. For doors 6' high and greater use 1" thick material

D. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth one side for horizontal applications, smooth two sides (S2S) for vertical applications; use for drawer bottoms, dust panels, vertical slot dividers, and other components indicated on drawings.

2.05 FABRICATION

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. Construction: As required for selected grade.

C. Cabinet support bases shall be fabricated from solid lumber.

D. Fabricate all drawers boxes using 1/2" inch, 9-ply laminated hardwood plywood. The top edges of the drawer box sides and back are radiused. Drawer bottom is let in on four sides, and securely glued underneath with a continuous bead of glue around the perimeter of the drawer bottom. Additional bottom braces are used on drawers over 24" wide. All components have one coat of clear waterproof sealer. Drawer boxes are screw-attached to separate drawer fronts.

E. Glazing for Doors: Clear tempered glass.

F. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.

G. Hardware Application: Factory-machine casework members for hardware that is not surface applied.

H. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.

I. Removable back panels on indicated base cabinets. Provide partial height back panels at sink cabinets.

J. Fixed panels at backs of open spaces between base cabinets.
   1. Provide cutouts for power and data receptacles where indicated on drawings.

K. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

L. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

M. Apron Frames: Construction similar to other cabinets, with modifications.
   1. Frames fabricated from panels standard with the manufacturer. Include front and back panels, with drawer suspension framing mechanically fastened to support channels spanning between them.
   2. Apron Drawers: Manufacturer's standard drawer construction and size for apron installation. Single drawer for aprons up to 48 inches wide, two drawers for wider aprons.

N. Countertop Panel-Type Supports: Materials similar to adjacent casework, 1-1/2 inch in width, with front-to-back and toe space dimensions matching base cabinet. Designed to be secured in a concealed fashion to countertop material. Include two leveling devices per support panel.

2.06 PLASTIC-LAMINATE-CLAD CASEWORK

A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base and tall cabinets.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
   2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
      a. Base Cabinets: 24 inches.
      b. Tall Cabinets: 24 inches.
      c. Wall Cabinets: 14 inches.
   3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
      a. See Section 01 6210 - Schedule of Materials and Colors for products Basis of Design and additional information.
      b. Finish: Matte or suede, gloss rating of 5 to 20.
      c. Surface Color and Pattern: As scheduled.
      d. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
      e. Cap exposed plastic laminate finish edges with plastic trim.
         1) 3mm PVC, flat shaped; smooth finish; of width to match component thickness

(a) Door and drawer fronts (Color match to face laminate).
(b) Counter top exposed edges (Color match to face laminate).

2) 1mm PVC, flat shaped; smooth finish; of width to match component thickness.
(a) Exposed component edges (Color match to face laminate).
(b) Backsplash and return exposed edges (Color match to face laminate).

2.07 COUNTERTOPS

A. Countertops: As specified in Section 12 3600.

2.08 CABINET HARDWARE

A. Manufacturer's standard types, styles and finishes, and as indicated below.

B. Comply with BHMA A156.9 requirements.

C. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 2 keys per lock.
1. Keying: Key locks alike within a space; key each room separately.
2. Master Key System: All locks operable by master key.

D. Shelves in Cabinets:
1. Shelf Standards and Rests: 4 Standards (K & V)#255, 4 Brackets/Shelf(K & V)#256.

E. Swinging Doors: Hinges, pulls, and catches. Hinges shall only allow 90 degrees maximum swing.
1. Hinges: Semi-concealed, number as required by referenced standards for width, height, and weight of door.
a. Semi-Concealed Hinges: Installed as required by hinge design, satin chromium plated over nickel on base material.
1) Butt hinges installed on cabinet edge, and on door edgefor overlay doors; five-knuckle, projecting barrel, minimum 2-1/2 inches long.
2. Pulls: Satin Chrome wire pulls, 4 inches wide (typical).
a. Pull design to comply with project's referenced accessibility requirements.
3. Catches: Magnetic.

F. Drawers: Pulls and slides.
1. Pulls: Satin Chrome wire pulls, 4 inches wide (typical).
a. Pull design to comply with project's referenced accessibility requirements.
2. Slides: Steel, full extension arms, ball bearings;capacity as recommended by manufacturer for drawer height and width.

G. Pull-Out Keyboard Tray
1. Each to have:(K & V)#5710

H. Clothes Rod each to have:
1. Rod(K & V)#770 5
2. Flange(K & V)#764 CHR

I. Adjustable Shelves at Display Cases, each to have:
1. Standards (K & V)#87
2. Brackets/Shelf(K & V)#186

J. Casters:
1. Swivel-type: 4-inch diameter wheels of soft or hard rubber and self-lube wheel bearing. Swivel is double-level, hardened ball bearing. All metal surfaces are zinc-plated.
2. Rigid-type: 4-inch wheels of soft or hard rubber, held in horns of formed steel, zinc plated. Wheel spanner bushings. Load capacity is 225 pounds per caster. Brake available on both swivel and rigid.

2.09 MATERIALS

A. Wood-Based Materials:
   1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
   2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

B. Concealed Solid Wood or Plywood: Any species and without defects affecting strength or utility.

C. Hardboard: ANSI A135.4, Class 1, tempered.

D. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications. complying with Grade requirements, and standard with the manufacturer.
   1. Provide specific types as follows:
      a. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, colors as scheduled, .
      b. Vertical Surfaces: VGS, 0.028 inch nominal thickness, colors as scheduled, .
      c. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, colors as scheduled, .
      d. Post-Formed Vertical Surfaces: VGP, 0.028 inch nominal thickness, colors as scheduled, .
      e. Flame Retardant Surfaces: HGF, 0.048 inch nominal thickness, colors as scheduled, .
      f. Cabinet Liner: CLS, 0.020 inch nominal thickness, colors as scheduled, .
      g. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

E. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered using horizontal tempering; 1/4 inch thick minimum; clear.

2.10 ACCESSORIES

A. 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.

B. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.

C. Grommets: Standard plastic or rubber grommets for cut-outs, in color to match adjacent surface.

D. Sealant for Use in Casework Installation:
   1. Manufacturer's recommended type.

PART 3 EXECUTION

3.01 PREPARATION

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.02 EXAMINATION

A. Site Verification of Environmental Conditions:
   1. Do not deliver casework until the following conditions have been met:
      a. Building has been enclosed (windows and doors sealed and weather-tight).
      b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
      c. Ceiling, overhead ductwork, piping, and lighting have been installed.
      d. Installation areas do not require further “wet work” construction.

B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
   1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inchper story.
   2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.

D. Verify adequacy of support framing and anchors.

E. Verify that service connections are correctly located and of proper characteristics.

3.03 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
   2. Variation of Bottoms of Wall Cabinets from Level: 1/8 inch in 10 feet.
   3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
   4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
   5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Secure wall and floor cabinets to concealed reinforcement and blocking at gypsum board assemblies.

G. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
   1. Where base cabinets are installed away from walls or service space framing, anchor to floor at toe space at not more than 24 inches on center, and at sides of cabinets with not less than two fasteners per side.

H. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.

I. Install hardware uniformly and precisely.

J. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.

K. Replace units that are damaged, including those that have damaged finishes.

3.04 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.05 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.06 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for manufactured casework.
   1. Plastic Laminate Countertops.
   2. Solid Surfacing Countertops and Sills.
   3. Natural Quartz Countertops.

1.02 RELATED REQUIREMENTS

A. Section 12 3200 - Manufactured Wood Casework.

1.03 REFERENCE STANDARDS

A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2016.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

D. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.

E. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 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. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.06 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.

1.07 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: See Section 12 3200.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Manufacturers:
         1) Arborite: www.arborite.com/#sle.
         2) Formica Corporation: www.formica.com/#sle.
         3) Lamin-Art, Inc: www.laminart.com/#sle.
         4) Panolam Industries International, Inc\Nevamar: www.nevamar.com.
         5) Panolam Industries International, Inc\Pionite: www.pionite.com.
         6) Wilsonart: www.wilsonart.com/#sle.
         7) Substitutions: See Section 01 6000 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. NSF approved for food contact.
      d. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
      e. Finish: Matte or suede, gloss rating of 5 to 20.
      f. Surface Color and Pattern: See Section 01 6210 - Schedule of Materials and Colors.
   2. Exposed Edge Treatment: Molded PVC edge with T-spline, sized to completely cover edge of panel.
      a. Color: As indicated.
   3. Back and End Splashes: Same material, same construction.
   4. Fabricate in accordance with manufacturer's standard requirements.

C. Solid Surfacing Countertops and Sills: Solid surfacing sheet or plastic resin casting self-supporting over structural members.
   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) Avonite Surfaces: www.avonitesurfaces.com/#sle.
         2) Dupont: www.corian.com/#sle.
         3) Formica Corporation: www.formica.com/#sle.
         4) Meganite, Inc: www.meganite.com/#sle.
         5) Relang International, LLC: www.duraseinusa.com/#sle.
         6) Wilsonart: www.wilsonart.com/#sle.
         7) Substitutions: See Section 01 6000 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. NSF approved for food contact.
      d. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      e. Color and Pattern: As Scheduled.
   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 manufacturer's standard requirements.

D. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin self-supporting over structural members.
   1. Flat Sheet Thickness: 3/4 inch, minimum.
   2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic 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) Cambria Company LLC: www.cambriausa.com/#sle.
         2) Dal-Tile Corporation: www.daltile.com/#sle.
         3) Terrazzo & Marble Supply Companies: www.tmsupply.com/#sle.
         4) Dupont: www.corian.com/#sle.
         5) Wilsonart: www.wilsonart.com/#sle.
         6) Substitutions: See Section 01 6000 - Product Requirements.
      b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
      c. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      d. NSF approved for food contact.
      e. Finish on Exposed Surfaces: Honed.
      f. Color and Pattern: As Scheduled.
   3. Other Components Thickness: 3/4 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 manufacturer's standard requirements.

2.02 MATERIALS

A. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
   1. 1-1/8" MDF, for tops without sinks.
   2. 1-1/8" MDF, meets or exceeds ANSI grade MR10 (moisture resistant) for tops with sinks.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, color to match counter.

2.03 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.

D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

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. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. 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 5219
UPHOLSTERED SEAT CUSHIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Upholstered Seat Cushions

1.02 REFERENCE STANDARDS

A. ASTM D3574 - Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams

B. NFPA 260 - Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, seat layout and dimensions.

D. Field Measurements: Verify seating layout by field measurements and record field dimensions on shop drawings.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver seats to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store seating units in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer’s Warranty: Manufacture agrees to repair or replace components of furniture specified that fails in materials or workmanship.

C. Warranty period is for the lifetime of the product.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fomcore: www.fomcore.com

B. Maharam: www.maharam.com

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED UNITS

A. Provide rectangle reading bench cushions as indicated on the drawings and as specified herein. Construction to consist of the following:
   1. No internal frame, plywood, or particle board, or base.
   2. Cushion shall sit 2” high unless otherwise indicated.
   3. Stitching shall be with marine grade thread
   4. Stitching shall be a double stitch with a top stitch on every seam.

2.03 MATERIALS

A. Polyurethane Foam:
   1. Density: 1.45 - 1.55 lbs/ft³ per ASTM D3574
   2. IFD @ 25% Deflection 4": 50.00 - 60.00 lbs/50 in² per ASTM D3574
   3. Elongation: 100% minimum per ASTM D3574
   4. Tensile Strength: 10 lbs/in² minimum per ASTM D3574
   5. Tear Resistance: 1.00 lbs/lineal inch minimum per ASTM D3574
   6. Support Factor: 1.80 minimum
   7. Fire Retardant: Pass, per Cal 117 - Open Flame & Smolder / MVS302 / ASTM E-1353 / NFPA 260 / UL-94 HBF
   8. Anti-microbial; Yes, per Method G21, Method 30, Method 147

B. Upholstery Fabric:
   1. Material: Vinyl/Urethane Topcoat
   2. Backing: Polyester
   3. Fire Retardant: Pass, per Cal 117 - Open Flame & Smolder / NFPA 260 Class 1 / UFAC Class 1
   4. Minimum 200,000 double rub count
   5. Antibacterial, Antifungal, Stain Resistant, No Heavy Metals, Formaldehyde Free
   6. Color and Pattern: As scheduled in Section 01 6210 - Schedule of Materials and Colors

C. Stitching: Thread shall be nylon, UV resistant and color matching

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of fixed wood niche. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's installation instructions and approved shop drawings.

B. Delivery, installation and setting-in-place shall be by a pre-arranged schedule; this schedule shall not conflict with other trades or create circumstances for merchandise to be damaged. Furnishings shall be installed only when areas involved are ready to receive them.

3.03 PROTECTION

A. Protect installed Furnishings and Upholstery from damage by work of other trades until Owner's acceptance of the work. Subcontractor to advise Interior Contractor of procedures and precautions for protection of materials and installed Furnishings and Upholstery from damage and of any required temperature/humidity conditions which must be maintained during the remainder of the construction period in areas of Furnishings and Upholstery installation.

B. Remove items damaged by failure to provide protection and/or protection information required above and replace without extra cost to Owner.

END OF SECTION

SECTION 14 2400
HYDRAULIC ELEVATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Complete hydraulic elevator systems.
   1. Passenger type without machine room

B. Elevator Maintenance Contract.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Includes elevator pit.

B. Section 04 2000 - Unit Masonry: Masonry hoistway enclosure; building-in and grouting hoistway door frames.

C. Section 05 1200 - Structural Steel Framing: Includes hoistway framing and overhead hoist beams.

D. Section 05 5000 - Metal Fabrications: Includes sill supports, divider beams, and overhead hoist beams.

E. Section 05 5133-Metal Ladders: Includes elevator pit ladders.

F. Section 07 1300 - Sheet Waterproofing: Waterproofing of elevator pit walls and floor.

G. Section 07 8400 - Firestopping: Fire rated sealant in hoistway.

H. Section 08 7100 - Door Hardware: Product requirements for key cylinders and card readers for placement by this section.

I. Section 09 2116.23 - Gypsum Board Shaft Wall Assemblies.

J. Division 21 - Fire Suppression: Fire Sprinkler System in Hoistway

K. Division 22 - Plumbing: Motor for sump pump in pit.

L. Division 26 - Electrical: Conduit and wiring connections.

M. Division 28 - Electronic Safety and Security: Fire detection and alarm systems.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. AISC 360 - Specification for Structural Steel Buildings; 2016.

D. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016.

F. ASME A17.1 - Safety Code for Elevators and Escalators; 2016.

G. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks; 2014.

H. ASME QEI-1 - Standard for the Qualification of Elevator Inspectors; 2024.

I. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

J. ASTM A139/A139M - Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over); 2016.

K. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

L. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

M. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

N. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

O. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

P. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

Q. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

R. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

S. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

T. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

U. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

V. ITS (DIR) - Directory of Listed Products; current edition.

W. NEMA MG 1 - Motors and Generators; 2017.

X. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2015, with Errata (2017).

Y. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Z. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

AA. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other installers to provide conduits necessary for installation of wiring including but not limited to:
      a. Elevator equipment devices remote from elevator machine room or hoistway.
      b. Remote group automatic panel from controller cabinet.
      c. Elevator pit for lighting and sump pump.
      d. Automatic transfer switch from controller cabinet.
      e. Fire alarm panel from controller cabinet.
   2. Coordinate work with other installers for equipment provisions necessary for proper elevator operation, including but not limited to, the following:
      a. Automatic transfer switches with auxiliary contacts for emergency power transfer status indication.
      b. Shunt trip devices for automatic disconnection of elevator power prior to fire suppression system activation.
      c. Overcurrent protection devices selected to achieve required selective coordination.

B. Preinstallation Meeting: Convene meeting at least one week prior to start of this work.
   1. Review schedule of installation, proper procedures and conditions, and coordination with related work.
   2. Review use of elevator for construction purposes, hours of use, scheduling of use, cleanliness of car, employment of operator, and maintenance of system.

C. Construction Use of Elevator: Provide designated elevator for transport of construction personnel and materials in compliance with ASME A17.1.

1. Owner to negotiate with manufacturer/installer for construction use of elevator in accordance with terms and conditions of manufacturer's temporary acceptance form.
2. Make elevator available for construction use as early as possible.
3. Enclose car with protective plywood on floor, walls, and ceiling.
4. Provide temporary lighting.
5. Provide control panel with manual and emergency operation.

1.05 SUBMITTALS

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

B. Product Data: Submit data on following items:
1. Signal and operating fixtures, operating panels, and indicators.
2. Car design, dimensions, layout, and components.
3. Car and hoistway door and frame details.
4. Electrical characteristics and connection requirements.

C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
2. Hoistway Components: Size and location of car guide rails, buffers, jack unit and other components.
3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
4. Clearances and over-travel of car.
5. Locations in hoistway and machine room of traveling cables and connections for car lighting and telephone.
6. Location and sizes of hoistway and car doors and frames.
7. Interface with building security system.
8. Electrical characteristics and connection requirements.
9. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.

D. Samples: Submit samples illustrating car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of cut sheets or finish color selection brochures.

E. Testing Agency's Qualification Statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Operation and Maintenance Data:
1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
2. Operation and maintenance manual.
3. Schematic drawings of equipment and hydraulic piping, and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on machine room and hoistway apparatus.

1.06 QUALITY ASSURANCE

A. Maintain one copy of each quality standard document on site.

B. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a licensed Professional Structural Engineer experienced in design of this type of work and licensed in Texas.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

D. Installer Qualifications: Trained personnel and supervisor on staff of elevator equipment manufacturer.

E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

F. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.

G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty for elevator operating equipment and devices for one year from Date of Final Acceptance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design - Hydraulic Elevators: Otis Elevator Company; www.otis.com; Hydrofit.

B. Other Acceptable Manufacturers - Hydraulic Elevators:
   1. Schindler Elevator Corporation: www.schindler.com.
   2. TK Elevator: www.tkelevator.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

D. Products other than Basis of Design are subject to compliance with specified requirements and prior approval of Architect. By using products other than Basis of Design, the Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

E. Source Limitations: Provide elevator and associated equipment and components produced by a single manufacturer and obtained from a single supplier .

2.02 HYDRAULIC ELEVATORS

A. Hydraulic Passenger Elevator:
   1. Hydraulic Elevator Equipment:
      a. Holeless hydraulic with cylinder mounted within hoistway.
   2. Operation Control Type:
      a. Selective Collective Automatic Operation Control.
   3. Service Control Types:
      a. Standard service control.
      b. Independent service control.
      c. Restricted Access service control.
   4. Interior Car Height: 96 inch. Confirm with elevator manufacturer.
   5. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
   6. Freight Car Loading Classification: Class A - General Freight Loading in compliance with ASME A17.1.
   7. Rated Net Capacity: 3500 pounds.
   8. Rated Speed: 100 to 125 feet per minute.
   9. Hoistway Size: As indicated on drawings. Confirm with elevator manufacturer.
   10. Interior Car Platform Size: As indicated on drawings. Confirm with elevator manufacturer.
   11. Travel Distance: As indicated on drawings.

12. Number of Stops: As indicated on drawings.
13. Hydraulic Equipment Locations:
    a. In Hoistway. No machine room provided.

2.03 COMPONENTS

A. Elevator Equipment:
1. Motors, Hydraulic Equipment, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Comply with NFPA 70. Refer to Division 26 for additional information.
2. Guide Rails, Cables, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.
3. Buffers:
    a. Spring type for elevators with speed less than or equal to 200 feet per minute.
4. Lubrication Equipment:
    a. Provide grease fittings for periodic lubrication of bearings.
    b. Grease Cups: Automatic feed type.
    c. Lubrication Points: Visible and easily accessible.
5. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator hoistway consisting of the following items:
    a. An oil hydraulic pump.
    b. An electric motor.
    c. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
    d. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
    e. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating - motors shall be capable of 80 starts per hour with a 30% motor run time during each start.
    f. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
        1) Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
        2) Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
        3) Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
        4) Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
        5) Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
    g. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.

h. Oil Type: Readily biodegradable that is USDA certified biobased product, ultra low toxicity, readily biodegradable, energy efficient, high performing fluid made from canola oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives. Especially formulated for operating in environmentally sensitive areas. USDA certified biobased product, 95% bio-based content, per ASTM D6866.

6. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)

B. Electrical Equipment:
   1. Motors: NEMA MG 1.
   2. Boxes, Conduit, Wiring, and Devices: As required by NFPA 70. Refer to Division 26 for additional information.
   3. Sump Pump in Pit: Refer to Division 22 for additional information.
   4. Spare Conductors: Provide ten percent in extra conductors and two pairs of shielded audio cables in traveling cables.

2.04 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).

B. Accessibility Requirements: Comply with ADA Standards.

C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.

D. Comply with seismic design requirements in accordance with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
   1. Complying with Elevator Safety Requirements for Seismic Risk Zone in accordance with ASME A17.1, ASCE 7 and other related requirements.
      a. Project Seismic Risk: As indicated on drawings.
   2. Provide earthquake emergency operations in accordance with ASME A17.1 requirements.

E. Perform welding of steel in accordance with AWS D1.1/D1.1M.

F. Fabricate and install door and frame assemblies in accordance with NFPA 80 and in compliance with requirements of authorities having jurisdiction.

G. Perform electrical work in accordance with NFPA 70.

H. Comply with fire protection sprinkler system of hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction (AHJ). Refer to Division 21 - Fire Suppression.

2.05 OPERATION CONTROLS

A. Elevator Controls: Provide vandal resistant landing operating panels and landing indicator panels.
   1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
   2. Landing Indicator Panels: Illuminating.
   3. Comply with ADA Standards for elevator controls.

B. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

C. Hoistway Access key-switch at top floor in entrance jamb.

D. Hoistway Access key-switch at lowest floor in entrance jamb.

E. Interconnect elevator control system with building security, fire alarm, card access, and smoke alarm systems.

F. Door Operation Controls:

1. Program door control to open doors automatically when car arrives at floor landing.
2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
3. Door Operation: Provide a direct current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. Closed-loop, microprocessor controlled motor-driven linear door operator, with adjustable torque limits, also acceptable. AC controlled units with oil checks or other deviations are not acceptable.
    a. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
    b. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
    c. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.
    d. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
    e. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
    f. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.
    g. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
4. Door Safety:
    a. Primary door protection shall consist of a two-dimensional, multi-beam array projecting across the car door opening. Under normal operation and for any door position, the system shall detect as a blockage an opaque object that is equal to or greater than 1.3 inches in diameter when inserted between the car doors at vertical positions from within 1 inch above the sill to 71 inches above the sill. Under degraded conditions (one or more blocked or failed beams), the primary protection shall detect opaque objects that are equal to or greater than 4” in diameter for the same vertical coverage. If the system performance is degraded to the point that the 4” object cannot be detected, the system shall maintain the doors open or permit closing only under nudging force conditions.

b. The secondary protection shall have an anti-nuisance feature which will ignore detection in the secondary zone after continual detection occurs for a significant time period in the secondary zone without corresponding detection in the primary protection zone; i.e. a person/object is in the entryway but does not enter. Normal secondary protection shall be re-enabled whenever a detection occurs in the primary zone.
c. The reaction time of the door detector sub-system shall not exceed 60 milliseconds when both primary and secondary protection capabilities are active; nor 40 milliseconds when the secondary protection is disabled.
d. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

G. Provide microprocessor-based control system with utilizes on-board diagnostics for servicing, trouble-shooting, and adjusting without requiring the use of an outside service tool. If an on-board diagnostic system is not provided, a handheld service tool (or laptop), owner's license, operation manual, and tool instructions must be provided in addition to the control system. System shall be a non-proprietary control system/open protocol. Provide remote elevator monitoring capabilities
1. Locate controller in hoistway or machine room as indicated.

H. Hall Stations
1. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with applicable accessibility standards.
2. All fixtures shall be designed to be VANDAL RESISTANT.
3. Provide keyed operating switch for access at hall stations.

I. Signal Devices and Fixtures
1. Car-Operating Panel: A panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. Raised markings Braille markings shall be provided for each push-button.
2. Car Fixture Finish:
a. Satin stainless steel
b. Applied car operating panel shall be furnished. It shall contain a bank of round metal mechanical illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served, an emergency call button, door open and door close buttons, and switches for lights, inspection and the exhaust fan. The emergency call button shall be connected to a bell that serves as an emergency signal. All buttons to have raised numerals and Braille markings. Red LED halo illumination with Flat Flush Target finishes: satin stainless steel.
3. Car Position Indicator.
4. A compliant communication device shall be provided which has been designed in response to applicable accessibility requirements integral with the car operating panel.
a. ADA Phone – Code Compliant Cellular Connectivity: See paragraph 2.11.
5. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.
6. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Raised markings shall be provided for each push-button.
7. Fixture Finish: satin stainless steel.
8. Landing Passing Signal: A chime bell shall sound in the car to tell a passenger that the car is either stopping at or passing a floor served by the elevator.

J. Provide "Firefighter's Emergency Operation" in accordance with ASME A17.1, applicable building codes, and authorities having jurisdiction (AHJ).
1. Designated Landing: Main Lobby.

2.06 OPERATION CONTROL TYPE

A. Selective Collective Automatic Operation Control: Applies to car in single elevator shaft.
   1. Refer to description provided in ASME A17.1.
   2. Automatic operation by means of one button in the car for each landing served and by "UP" and "DOWN" buttons at the landings.
   3. Stops are registered by momentary actuation of landing car buttons without consideration of the number of buttons actuated or the sequence buttons are actuated, but the stops are made in the order that landings are reached in each direction of travel.
   4. All "UP" landing calls are made when car is traveling in the up direction.
   5. All "DOWN" landing calls are made when car is traveling in the down direction.
   6. Uppermost and lowermost calls are answered as soon as they are reached without consideration of the car travel direction.

2.07 SERVICE CONTROL TYPE

A. Independent Service Control:
   1. Provide key operated "Independent Service" on car operating panel. Activation will remove that car from normal operation and cancel pre-registered car calls.
   2. Car will respond to selected floor. Car will not respond to any calls from landing call buttons. Car will only respond to calls placed on the car operating panel. Doors will remain open at last landing requested. Doors will close with a constant pressure on "Door Close" button.
   3. Key activation to normal operation will return car to normal operation.

B. Restricted Access Service Control:
   1. Landing Call Lock-out: Provide card reader provisions or a key operated switch with spring return with key removable only in "Lock-Out" position in landing control station that performs the following when activated:
      a. Restricts or permits landing call registration for that landing.
      b. Causes the elevator to not respond to that landing.
   2. Allow "Firefighter's Emergency Operation" to take control priority over "Restricted Access Service Control".

2.08 EMERGENCY POWER

A. Set-up elevator operation to run with elevator emergency power supply when the normal building power supply fails, and in compliance with ASME A17.1 requirements.

B. Elevator Emergency Power Supply: Supplied by battery backup; provide elevator system components as required for emergency power characteristics.

C. Emergency Lighting: As selected from manufacturers standard line.

D. Provide operational control circuitry for adapting the change from normal to emergency power.

E. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.

2.09 MATERIALS

A. Steel Cylinder Casing: ASTM A139/A139M, Grade A steel.

B. Rolled Steel Sections, Shapes, Rods: ASTM A36/A36M.

C. Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel), with matte finish.

D. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

E. Stainless Steel Sheet: ASTM A666, Type 441; No. 4 Brushed finish unless otherwise indicated.

F. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 441.

G. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.

H. Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, O temper.

I. Tempered Glass: 1/4 inch minimum thickness, fully tempered in compliance with ASME A17.1, 16 CFR 1201, ANSI Z97.1, and ASTM C1048 tempered glass requirements.

J. Laminated Glass: 3/8 inch minimum thickness, and in compliance with ASME A17.1, 16 CFR 1201, ANSI Z97.1, and ASTM C1172 laminated glass requirements.

2.10 CAR AND HOISTWAY ENTRANCES

A. Elevator, as indicated on drawings:
   1. Car and Hoistway Entrances, Each Elevator Floor Lobby:
      a. Hoistway Fire Rating: As indicated on drawings.
      b. Elevator Door Fire Rating: As indicated on drawings.
      c. Framed Opening Finish and Material: Brushed stainless steel.
      d. Car Door Material: Stainless steel, with rigid sandwich panel construction.
      e. Hoistway Door Material: Stainless steel, with rigid sandwich panel construction.
      f. Door Operation: As indicated on the drawings.
      g. Door Width: As indicated on drawings.
      h. Door Height: As indicated on drawings.
      i. Sills: Extruded aluminum.

B. Sills/Thresholds: Configure to align with frame return and coordinate with floor finish.

C. Gasketing: Provide acoustic type gasketing at hoistway doors and frames to minimize audible noise due to car activities in the hoistway, and air pressure differential between hoistway and landing floors.

2.11 CAR EQUIPMENT AND MATERIALS

A. Elevator Car:
   1. Car Operating Panel: Provide main; flush-mounted applied face plate, with vandal resistant illuminated call buttons corresponding to floors served with hoistway access, "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, alarm button, and top of car inspection.
      a. Panel Material: Integral with front return; one per car.
      b. Car Floor Position Indicator: Above door with illuminating position indicators.
      c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch above car finished floor.
      d. Emergency Communications System: Integral phone system provided. ADA Phone – Code Compliant Cellular Connectivity: Contractor shall provide a phone service through a self-contained cellular based VoIP system. This system shall meet code, include a backup battery capable of powering the emergency communication equipment for 4+ hours in the event of a power outage. The solution shall have remote monitoring capability to ensure continuous connectivity with a means of remote troubleshooting. Remote monitoring capability shall include, at a minimum, the ability to monitor connectivity and power supply. Remote monitoring shall be capable of providing local alerts to response personnel when on-site intervention is required.
   2. Ventilation: Two speed fan with ventilation per manufacturer standard operation.
   3. Subfloor: Underlayment grade, exterior plywood, 5/8" nominal thickness.
   4. Flooring: See Schedule of Materials and Colors for required flooring. Adjust recess for flooring material as well as load capacity of car. The flooring contractor must be an approved TDLR Vendor or you must subcontract the flooring through the elevator company. This is required for final elevator inspection with TDLR.

5. Wall Base: Recessed stainless steel, 4 inch high.
6. Front Return Panel: Stainless steel.
7. Side Walls: Plastic laminate on plywood.
8. Rear Wall: Plastic laminate on plywood.
9. Hand Rail: Stainless steel, at rear wall. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
    a. Round, Metal Tube: 1-1/2 inch diameter.
    b. Stainless Steel Finish: No. 4 Brushed.
10. Ceiling: Downlight type, metal pans with suspended LED downlights.
    a. Canopy Ceiling: Stainless steel.
11. Provide emergency access panel for egress from car at ceiling.
12. On/Off Light Switch located in car operating panel.

B. Car Accessories:
1. Certificate Frame: Stainless steel frame glazed with tempered glass, and attached with tamper-proof screws.
2. Protective Pads: Canvas cover, padded with impact-resistant fill material, sewn with piping edges; fire resistant in compliance with ASME A17.1, covering side and rear walls and front return; provide one set for each elevator.
    a. Color: As selected by Architect.
    b. Provide at least 4 inch clearance from bottom of pad to finished floor.
    c. Pad Supports: Stainless steel studs, and mounted from ceiling frame.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting this work.

B. Verify that hoistway, pit, and machine room are ready for work of this section.

C. Verify hoistway shaft and openings are of correct size and within tolerance.

D. Verify location and size of machine foundation and position of machine foundation bolts.

E. Verify that electrical power is available and of correct characteristics.

F. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Arrange for temporary electrical power for installation work and testing of elevator components, and comply with requirements of Section 01 5000 - Temporary Facilities and Controls.

B. Maintain elevator pit excavation free of water.

3.03 INSTALLATION

A. Coordinate this work with installation of hoistway wall construction.

B. Install system components, and connect equipment to building utilities.

C. Provide conduit, electrical boxes, wiring, and accessories. Refer to Division 26 for additional information.

D. Install hydraulic piping between cylinder and pump unit.

E. Mount machines, motors, and pumps on vibration and acoustic isolators.
1. Place on structural supports and bearing plates.
2. Securely fasten to building supports.
3. Prevent lateral displacement.

F. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.

G. Install guide rails to allow for thermal expansion and contraction movement of guide rails.

H. Accurately machine and align guide rails, forming smooth joints with machined splice plates.

I. Bolt brackets to self drilling expansion shell anchors.

J. Field Welds: Chip and clean away oxidation and residue with wire brush; spot prime surface with two coats.

K. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.

L. Fill hoistway door frames solid with grout in accordance with Section 04 2000.

M. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.

N. Machine Room Components: Clean and degrease; prime one coat, finish with one coat of enamel.

O. Wood Surfaces not Exposed to Public View: Finish with one coat primer; one coat enamel.

P. Adjust equipment for smooth and quiet operation.

3.04 TOLERANCES

A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.

B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Testing and inspection by regulatory agencies will be performed at their discretion.
   1. Schedule tests with agencies and notify Owner and Architect.
   2. Obtain permits as required to perform tests.
   3. Document regulatory agency tests and inspections in accordance with requirements.
   4. Perform tests required by regulatory agencies.
   5. Furnish test and approval certificates issued by authorities having jurisdiction.

C. Perform testing and inspection in accordance with requirements.
   1. Inspectors shall be certified in accordance with ASME QEI-1.
   2. Perform tests as required by ASME A17.2.
   3. Provide at least two weeks written notice of date and time of tests and inspections.
   4. Supply instruments and execute specific tests.

D. Perform tests in the presence of Owner and Architect.

E. Operational Tests:
   1. Perform operational tests in the presence of Owner and Architect.
   2. At an agreed time, and the building occupied with normal building traffic, conduct tests to verify performance.
      a. Furnish event recording of each landing call registrations, time initiated, and response time throughout entire working day.

3.06 ADJUSTING

A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.

B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch maximum from flush with sill.

3.07 CLEANING

A. Remove protective coverings from finished surfaces.

B. Clean surfaces and components in accordance with manufacturers written instructions.

3.08 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 equipment to Owner's designated representative.

D. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Conduct walking tour of project.
   3. Briefly describe function, operation, cleaning and maintenance of each component.

E. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site, unless noted otherwise.

3.09 PROTECTION

A. Do not permit construction traffic within car after cleaning.

B. Protect installed products until Date of Substantial Completion.

C. Touch-up, repair, or replace damaged products and materials prior to Date of Substantial Completion.

3.10 MAINTENANCE

A. Refer to Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to initial maintenance service.

B. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for 12 months from Date of Substantial Completion.

C. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or original installer.

D. Maintenance contract services shall not be assigned or transferred to any agent or other entity without prior written consent of Owner.

E. Examine system components periodically.

F. Include systematic examination, adjustment, and lubrication of elevator equipment.

G. Maintain and repair or replace parts, whenever required, using parts produced by original equipment manufacturer.

H. Perform work without removing cars from use during peak traffic periods.

I. Provide emergency call back service during regular working hours throughout period of this maintenance contract.

J. Maintain an adequate stock of parts for replacement or emergency purposes, and have personnel available to ensure the fulfillment of this maintenance contract without unreasonable loss of time.

END OF SECTION

SECTION 14 4100
PEOPLE LIFTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Ceiling-mounted patient transfer system.

1.02 RELATED SECTIONS:

A. Section 05 5000 – Metal Fabrications.

B. Section 06 1000 – Rough Carpentry.

C. Section 09 5100 – Acoustical Ceilings.

1.03 REFERENCES

A. Americans with Disabilities Act (ADA).

B. Texas Accessibility Standards (TAS).

1.04 DEFINITIONS

A. Ceiling Mounted Patient Transfer System includes remote hand control, battery charging system, patient slings, warranty and devices as indicated and required for the safe operation of the ceiling mounted patient transfer system.

1.05 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 3000 – Administrative Procedures, Shop Drawings, Product Data and Samples. Include manufacturer's installation instructions and track layout.

B. Closeout Submittals:
   1. Submit under provisions of Section 01 7800 - Closeout Submittals.
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 - Closeout Submittals for the following items:
      a. All mastics, glues, and adhesives

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Amico Mobility Solutions Corporation: www.amico.com.

B. Guldmann, Inc.: www.guldmann.net

C. Horcher Lifts: www.horcherlifts.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 OVERHEAD LIFTING SYSTEM

A. System Description: Provide ceiling-mounted battery operated personnel transfer system complete with sling, straight and curved track system.
   1. Basis of Design: Amico Mobility Solutions Corporation, GoLift400.

B. System Requirements:
   1. Load rating for portable lifts: 400 pound capacity
   2. Travel (up/down): 1 inch per second.
   3. Charger:
      a. Input: 100-240V AC
      b. Output: 36V DC, 1.0A, 40W
   4. Motor: 1 per room where patient transfer is required.
   5. Battery: High Capacity, Nickel Metal Hydride (NiMH)
   6. Emergency Lowering: Electrical and Mechanical

7. Provide all accessories and equipment required for transfer between rooms.

C. Provide Warranty for ceiling mounted patient transfer system that matches or exceeds:
   1. 2 years on all overhead lift system parts
   2. 1 years on all labor
   3. 1 year on all patient slings

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installed transfer system securely anchored to provide rigid installation. Lift shall be installed in strict accordance with manufacturer's instructions.

B. Coordinate adequate supports in ceiling per manufacturers requirements for pendant support system.

C. Maximum suspension from support steel to finished ceiling shall be no greater than 60". Any distance greater than 60" shall require additional support steel provided by others.

3.02 FIELD QUALITY CONTROL

A. Certificate: The distributor or manufacturer's representative shall certify, in writing, to the Owner that the installation, adjustment and performance are in accordance with the manufacturer's recommendations.

3.03 ADJUST AND CLEAN

A. Adjusting: Carefully adjust and regulate the transfer system after installation.

END OF SECTION

SECTION 21 0000

MECHANICAL SPECIAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. This specification section shall be applicable to Division 21 – Fire Suppression, Division 22 – Plumbing and Division 23 – HVAC.

B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

C. **Tornado Shelter:** All products, materials, and installation of mechanical, plumbing and fire protection work located within the Tornado Shelter shall comply with the requirements under Section 01 1400 – Work Restrictions. This shall include, but not be limited to, anchorage of any products and systems, fire rating requirements, penetration sizes through the structure, support of distribution systems, and location of components in or near the baffling chambers or ventilation openings.

D. The above provisions shall take precedence over this section where discrepancy may exist.

1.02 DEFINITIONS

In addition to the Supplementary General Conditions, the following definitions shall apply to this DIVISION.

A. "Contractor" - Refers to the Contractor or Contractors for Mechanical Contract Work.

B. "Subcontractor" - Refers to a Subcontractor to whom the Contractor has awarded a defined portion of the Mechanical Contract Work.

1.03 CONTRACTOR QUALIFICATIONS

A. Contractor shall be able to prove considerable experience on jobs of similar nature and size that were completed to the satisfaction of the respective Owners and Architects, and that he is in position at present, both financially and in terms of qualified personnel, to complete this project to the full satisfaction of the Owner and Architect. Failure to qualify will be considered adequate cause of rejection of bid.

1.04 BIDS

A. Submission of a bid guarantees complete understanding of the extent and character of the work involved, including site conditions, working conditions and the material and labor required as described on the plans and/or specifications or which may be fairly implied as essential for a complete installation.

1.05 INSPECTION OF SITE

A. Contractor submitting proposals for this work shall first make an on-the-spot examination of the site, and all conditions thereon and/or therein. All proposals shall take into consideration such conditions as may affect the work under the respective contract. Submission of a bid will be taken as evidence that this inspection has been made.

1.06 LOCAL CUSTOMS

A. Contractor shall comply with local customs as to which particular trade shall install any part or parts of any work or equipment shown or specified, and shall plan and execute his work in this regard so as not to interfere with other Contractors on this project.

1.07 DRAWINGS

A. Drawings numbered with the prefix "MEP", “MP”, "M", “P”, “FP”, and "E" show the extent of the work contemplated.

B. The general construction plans of the building and specifications for all trades are on file in the office of the Architect, and shall be inspected by all bidders.

C. The plans show diagrammatically the sizes and locations of the various equipment items, as well as interconnecting piping and ductwork, without necessarily showing exact details as to sizes, locations, elevations, transitions, offsets, power and control lines, refrigerant and drain piping, and other similar installation details. Contractor shall carry out his work in accordance with the plans to conform to actual site conditions in cooperation with all other Contractors and trades as required to avoid conflicts and fit within available spaces, to maintain proper grading of lines, and to provide a complete and operating installation. Any offsets, transitions, relocations, etc., as necessary to accomplish this intent shall first be approved by the Engineer, and shall be carried out as necessary at no additional cost to the Owner.

D. It is the intent of the contract documents to provide complete and operable installations in every respect. It shall be the responsibility of the Contractor to provide material, equipment and components that may be fairly implied as essential for said complete installation, whether or not specifically indicated.

E. Exceptions and inconsistencies in plans and specifications shall be brought to the attention of the Engineer before contract is signed. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular circumstance.

F. The plans are intended to show the general arrangement and the extent of the work contemplated. The exact location and arrangement of all parts shall be determined after equipment has been approved by the Engineer as the work progresses, to conform in the best possible manner with the surroundings and as directed by the Engineer.

G. Figured dimensions shall be followed without regard to scale - where no figures or notations are given, the plans shall be followed, subject to field verification before doing any work.

1.08 SYMBOLS

A. Symbols for the various outlets, piping, and related systems are noted on the plans, and shall be strictly adhered to in connection with all work. Should the Contractor be in doubt regarding the real meaning and intent of the various symbols used, he shall confer with the Architect for interpretation, who will confer with the Engineer as appropriate, and whose decision shall be final.

1.09 SUBSTITUTIONS

A. Contractor, if desirous of using equipment and/or materials other than that specifically called for in the drawings and specifications, shall adhere to the substitution procedure specified under Section 01 2500 Product Substitutions of these specifications.

1. Such items as are considered by the Engineer to be generally acceptable shall then be submitted for final review according to the procedures outlined for all equipment under SHOP DRAWINGS AND SUBMITTAL DATA.

2. Such items as are considered by the Engineer to be generally not acceptable shall be prohibited from further consideration for this project.

1.10 SHOP DRAWINGS AND SUBMITTAL DATA

A. Contractor shall furnish detailed shop drawings, catalogue and submittal data in accordance with said procedure as specified under Section 01 3300 Submittal Procedures, included in these specifications.

B. Shop drawing and/or catalogue data shall be submitted on the items listed in each Mechanical Section, but shall not be necessarily limited to these items.

C. All shop drawings, product data and samples submitted by the Contractor shall illustrate details of work, equipment, materials, products, systems, designs or workmanship that the Contractor intends to use in order to comply with the design concept established in the contract documents. The Engineer's review of these submittals is only for the limited purpose of checking the same for conformity with the design concept of the work as established in the contract documents, and is not intended to be for the purpose of determining the accuracy of other matters that may be contained in such submittals, including but not limited to such matters as dimensions, quantities, specific code compliance, performance of equipment and systems designed by the Contractor, Contractor-furnished engineering and design, construction means, methods, techniques, sequences, procedures or safety precautions; the correctness of which as set forth in the contract documents or submittal shall be the sole responsibility of the Contractor. The Architect shall undertake its review with reasonable promptness so as to cause no delay. The Architect's review of a specific item shall not indicate approval of an assembly of which the item is a component or in which it functions.

D. Any review and acknowledgement of the submittals by the Engineer does not relieve the Contractor of his responsibility for performance of the work in accordance with all provisions and requirements of the contract documents.

E. Shop drawings and submittal data relating to dimensions, sizes, and quantities of equipment and material, and/or to illustrations representing the manner in which equipment, piping, ductwork, etc., will be placed in spaces indicated and/or allowed, will be examined under the assumption that the Contractor has verified all conditions. Acceptance thereof shall not relieve the Contractor of responsibility in the event that equipment, material, etc., cannot be installed as shown on the drawings.

1.11 EQUIPMENT LIST, PROGRESS SCHEDULES, ESTIMATES

A. Contractor shall prepare and furnish to the Architect an equipment list tabulating each item of material and equipment required and giving the date upon which the order is placed, the date of submittal of shop drawings, and the anticipated date of delivery of the item.

B. Contractor shall prepare and furnish to the Architect a "Construction Progress Schedule". This schedule shall indicate in form satisfactory to the Architect the proposed dates of commencement and completion of the entire work.

1.12 ORDINANCES, PERMITS, AND CERTIFICATES

A. All labor and materials shall be in strict conformance with the rules and recommendations of the International Construction Codes, National Fire Protection Association, municipal and state codes and regulations, local electric, telephone, and gas companies, American Gas Association, National Electrical Code, International Energy Conservation Code, or any other authorities that may have lawful jurisdiction pertaining to the work.

B. Each Contractor shall procure all necessary permits, licenses, or inspections to carry out his work and shall pay the lawful fees therefor. Each Contractor shall procure and pay for all necessary certificates of approval, which must be delivered to the Architect before final acceptance of the work.

C. Work shall be installed as indicated on the drawings, unless drawings and/or materials conflict with Code requirements governing, in which case, the Code shall be followed without additional charge to the Owner.

1.13 UTILITIES AND EXISTING WORK

A. The locations, sizes, types, depths, pressures, and direction of flow of various existing or proposed new piping systems and/or utility mains, as well as any existing HVAC, air distribution and control systems indicated, and the locations, sizes, types, and characteristics of various existing or proposed new electric and telephone service feeders and facilities, are shown in accordance with the best information available and with data secured from the various departments of the City and the utility companies involved. Data shown is offered as an estimating guide without guarantee of accuracy. Each bidder shall make complete investigations of the site, and shall check and verify all data given to the extent that is reasonably possible before entering a bid. Full responsibility for all complications arising from unverified data shall rest with the Contractor or Contractors involved.

1.14 EQUIPMENT SIZES

A. Large pieces of equipment, which are to be installed in the building, and which are too large to permit access through doorways, stairways, or shafts, shall be brought to the job by this Contractor and placed in spaces before the enclosing structure is completed. Where existing walls, etc., must be removed to permit installation of large equipment, removal work shall be handled in the same manner as specified for CUTTING AND PATCHING. Equipment shall be cribbed up from the floor by the Contractor and covered with tarpaulins or other protective covering where necessary or directed.

B. Equipment components and associated distribution arrangements located in mechanical spaces, above ceilings, on roof, or at grade, shall be installed to fit within each space allowed without compromising required service clearances, access and head room for maintenance personnel, and code requirements. The Contractor shall verify that all equipment and components submitted, or proposed to be installed can fit within each space allowed in a manner that satisfies these requirements. The Contractor shall submit drawings showing any deviations from system arrangements indicated on the plans for approval by the Engineer, and shall carry out his work to accomplish this intent at no additional cost to the Owner.

C. Should any equipment submitted or proposed by the Contractor have rated loads and/or electrical characteristics that are different from those indicated or scheduled on the drawings or described in the specifications, and that are otherwise found to be acceptable by the Engineer, it shall be the Contractor's responsibility to coordinate with the other Contractors and Subcontractors to provide properly sized services required subject to the approval of the Engineer and at no additional cost to the Owner.

1.15 PROTECTION OF WORK AND MATERIALS

A. All work, materials, and equipment, whether incorporated in the building or not, shall be protected at all times against the weather (rain, windstorms, frost, ice, or heat) so as to maintain them free from injury or damage. All equipment and materials shall be stored in a dry location. At the end of each day's work, all work likely to be damaged shall be covered.

B. Building openings shall be covered to protect the building from the weather.

C. Finished floors, step treads, Owner's equipment, and all finished surfaces, exterior or interior, shall be protected against damage during the work. Wherever materials are hoisted to the roof or carried into the building, surfaces must be covered with a layer of heavy building paper.

D. Equipment shall be kept out of the weather, and shall be kept covered. Where work is to be done above equipment, the Contractor shall provide full and solid wood platforms above such equipment, to prevent its being damaged or soiled.

E. Any and all equipment, piping, motors, insulation, etc., which in the opinion of the Architect becomes damaged, abused, inundated, or otherwise harmed beyond normal and minor repair, shall be replaced with new equipment or material at no additional cost to the Owner. At the completion of the work, all equipment shall be thoroughly cleaned and the entire system delivered in a perfect, unblemished condition.

F. The Contractor shall be proportionately and respectively responsible for all damage done to the Owner's property or adjacent properties during the construction. The above protection shall be maintained while work is being done, and in no case shall dirt or grit be ground into floor finishes or floor coverings.

G. Contractor shall furnish and install adequate barriers and safety devices to protect his and his subcontractor's workmen as well as the general public from hazardous conditions.

H. Contractor shall comply with the applicable provision of all Texas and U.S. Department of labor safety and health standards and amendments.

I. Welding or torch cutting operations may be done only in approved incombustible areas if possible, or shall include adequate precautions as approved to prevent sparks dropping on combustible material. Protection shall be provided over persons working underneath or nearby.

J. Contractor shall properly flameproof and securely tie all tarpaulins and provide vertical shoring to form a rigid frame wherever they are used. Temporary coverings shall be removed as soon as they have served their purpose or when permanent closures have been installed.

K. Gasoline, oils and other volatile liquids shall be stored outside the building and brought into the building in small quantities when needed. Such materials shall be stored in a well-ventilated location, spaced not less than twenty (20) feet away from all open heating devices or other hazardous devices. Contractor shall take particular care in all storage space to eliminate spilling or the accumulation of oily wastes, and shall provide approved waste and safety cans and dispensing pumps.

1.16 STORAGE OF MATERIALS

A. The Contractor shall be responsible for the transportation of his materials to and on the job, and shall provide space for storage of his materials and equipment at ground level. Roof surfaces shall not be used for storage of materials or equipment. Any storage within the building shall be approved by the Architect prior to use of the space, with due consideration to fire hazards involved.

B. Pipe, fittings, or other material stored outside of buildings shall be set on wood or steel racks or platforms at least 12" above grade. All necessary provisions shall be made to keep water and debris away from such stored materials. Ends of pipes and valves shall be kept sealed until used.

C. Equipment subject to rusting shall be kept warehoused until just prior to setting.

D. Each Contractor shall remove from time to time all equipment, unused material, rubbish and debris of any kind that may accumulate during the execution of the work. All premises, including the outside area, shall be kept clean and free from unnecessary impediments, rubbish and debris at all times.

1.17 LOCATION OF DEVICES

A. The locations of all pipes, outlets, appliances, etc. shown on the plans, if not specifically dimensioned are approximate only, and understood to be subject to minor revisions as may be found necessary or desirable at the time work is installed. Changes in locations of up to 8'-0" shall be made when requested by the Architect, at no additional cost to the Owner.

B. Generally, all outlets shall be properly centered in rooms, panels, and other finished work, shall not interfere with outlets or equipment of other Contractors, and shall meet the dimensioned or large-scale architectural drawings.

1.18 CLEANING, TESTING, AND ADJUSTING, GENERALLY

A. The Contractor shall at his own expense, during the progress of the work, or upon its completion, make such tests of his work as hereinafter specified under the various sections, as required by the Architect and under his supervision.

B. The Contractor shall furnish all necessary labor, fuel, electricity, apparatus, piping, etc., as required for tests. The Contractor shall take all precautions necessary to prevent damage to the building during tests, and he shall be liable and pay for all damage incurred during the tests.

C. All leaks and defects discovered by the tests shall be immediately repaired or replaced and tests conducted over until tests prove the systems are satisfactory. No caulking of threaded piping or any accelerated rusting of any piping will be permitted to stop leaks.

1.19 IDENTIFICATION OF PIPING AND EQUIPMENT

A. All items of major mechanical equipment, such as boilers, chillers, pumps (all types), air handling units, A/C units, fans, etc., shall be provided with plastic laminated nameplates, engraved with same designation as appears on the drawings.

B. Each motor starter, contactor, pushbutton station, control relay, disconnect switch (where not immediately adjacent to and/or obviously related to any of the foregoing), and all similar electrical and/or other control devices shall be provided with an approved metallic or plastic laminated nameplate, engraved with the name, horsepower, voltage, phase, and/or other special characteristic of the equipment served. Nameplate names shall correspond to those used on the drawings.

C. All piping (both insulated and bare) shall be identified as to service and characteristic on 20-foot centers and/or as directed. Directional arrows, not less than 1/2" wide and not less than 6" long shall be permanently stenciled or affixed to each line at each code band. Arrows and stenciling shall be so located as to be clearly visible by a person standing on the floor or adjacent service platform, but not more than 20'-0" apart. Stick-on pipe markers are not acceptable.

D. Valves shall be identified as specified under SECTION 22 2000 – PLUMBING VALVES, STRAINERS & UNIONS.

1.20 ACCESS DOORS

A. The Contractor shall furnish and install an access door for each valve, group of valves, or other controlling mechanism that would otherwise be concealed in the building construction. Size and type of doors shall be as specified under Architectural Specifications for access doors. Proposed locations of doors and associated valves shall be as approved by the Architect before work begins. Access doors shall be easily accessible and unobstructed by equipment or other fixtures etc.

B. Access doors will not be required in "lay-in" type accessible ceilings, except as otherwise noted.

C. The Contractor shall review the architectural plans and specifications for the various surface finishes, and shall coordinate the number and type of access doors to be furnished.

1.21 SLEEVES

A. The Contractor shall provide sleeves for all service lines (including ductwork) passing through walls, floors, ceilings, roof, etc., subject to the approval of the Architect. Where sleeves pass through fire-rated partitions or floors, U.L. approved firestop system shall be used to seal up openings around pipes, ducts and sleeves. Firestop system shall be "Hilti" or approved equal.

B. All plastic (PVC) pipe penetrating fire-rated construction shall be provided with fire stop system per ASTM E814 or UL 1479.

C. Provide 2" high cast-in-place sleeves or curbs at all floor pipe and duct penetrations, caulked with steel wool and flexible sealant.

D. Refer to Architectural Specifications for additional fire stop information and details.

1.22 ESCUTCHEONS

A. All exposed pipes passing through walls, floors, ceilings, and interior parts of cabinetwork, shall be provided with escutcheons.

1.23 ROOF PENETRATIONS

A. All roof penetrations shall be provided with base and counter flashings arranged to provide a weather tight installation, which shall include, where required, ventilating collars to give proper clearance from combustible roofs, floors, ceilings, etc. Roof penetrations shall be a minimum of 4'-0" from adjacent walls, roofs, curbs, equipment, etc. Refer to Architectural Drawings for additional roof flashing information.

1.24 ELECTRIC MOTORS AND CONNECTIONS, GENERALLY

A. All motor horsepower ratings called for on the plans or in these specifications are minimum acceptable ratings based on the original design and on the use of the equipment exactly as detailed or specified. Any change in motor size brought on directly or indirectly by substitution of equipment having characteristics peculiar to it requiring such change shall be the responsibility of the Contractor furnishing the motor, unless the Owner initiated the substitution.

B. The responsibility of the Contractor as mentioned above shall include the furnishing and installing of the proper size motor and drive, subject to the approval of the Engineer and free of any additional cost. It shall also include responsibility for any increase in electrical equipment and installation costs, over and above that required to comply with the original design.

C. The Contractor furnishing the motor shall install it, and shall furnish all starting and control equipment, except for that specifically noted to be furnished as an integral part of electrical switchgear or motor control centers. Each and every motor shall have a starter with overload and undervoltage protection. Except as otherwise specifically indicated, each starter shall be provided with a heavy-duty pushbutton station.

1.25 OPERATING INSTRUCTIONS

A. At the completion of the work, the Contractor shall prepare deliver complete operating instructions and maintenance brochures in accordance with procedures specified under Section 01 7800 Closeout Submittals, included in these specifications.

B. The operating instructions and maintenance brochures shall consist of a typewritten description of equipment capacities, system operation, and required maintenance actions, as well as necessary control and wiring diagrams with control sequence descriptions, keyed to the valve and piping identification systems, and shall include the various operating instructions as received with each piece of equipment.

C. The project will not receive final acceptance until the Owner has received the operating instructions and maintenance brochures.

D. The Contractor shall instruct the Owner's operating personnel in the proper operating and maintenance of the equipment and systems for a period of not less than two (2) day of not less than eight (8) hours. One (1) day of instruction shall be timed to include a normal seasonal changeover.

E. Mechanical equipment shall each be provided with a maintenance label to include the title and publication number of each unit, as well as the operation and maintenance manual for that particular model and type of product, in accordance with the International Energy Conservation Code.

1.26 RECORD DRAWINGS

A. The Contractor shall refer to the Architectural Specifications for record drawing submission requirements and close-out submittals. As the work progresses, the Contractor shall make any and all corrections on the drawings, clearly indicating actual changes from the original drawings. Final approval of the installations will not be given until these drawings have been received and accepted by the Architect.

B. The Plumbing Drawings shall indicate clearly the actual location of piping, valves, fixtures, etc. Depth of underground piping outside the building shall be shown, and changes of direction and intersection of the underground lines shall be dimensioned from the building walls, etc.

C. The Heating and Air Conditioning Drawings shall indicate clearly the actual location of piping, valves, ductwork, and equipment. The Contractor shall indicate the actual cfm of air being handled by each and every inlet or outlet or duct system as actually measured by instrument on the job.

1.27 SITE OBSERVATION VISITS

A. The purpose of the site observation is to determine whether the Contractor appears to be performing the work in a proper and workmanlike manner, that he is apparently installing the work in accordance with the intent of the drawings and specifications and that in the Architect and Engineer's opinion, the work is satisfactory. Site observation is not intended to be an exhaustive inspection of all project elements, and does not in any manner relieve the Contractor's responsibility to carry out his work in accordance with the drawings and specifications.

B. It shall be the duty of each Contractor to personally make a special observation trip of the whole project and assuring himself that the work on the project is ready for final observation before calling upon the Architect and Engineer to make a final observation visit.

C. In order not to delay final acceptance of the work, each Contractor shall have all necessary bonds, guarantees, receipts, affidavits, etc., called for in the various articles of this specification, prepared and signed in advance, and together with a letter of transmittal, listing each paper included, shall deliver same to the Architect at or before the time of said final observation visit. The Contractor is cautioned to check over each bond, receipt, etc., before preparing it for submission to see that the terms check with the requirements of the specification.

D. Final observation shall not be scheduled by the Contractor until project installation is complete and functional, with all applicable equipment and systems tested, balanced and commissioned, and with associated TAB and commissioning reports submitted and accepted. Substantial completion will not be accepted until all such conditions are met.

E. If the Engineer having performed a final/overhead job-site observation, determines that the project is not ready for observation and has to be rescheduled for another date, the Contractor will be charged and shall pay $1,000.00 for each subsequent observation visit.

1.28 SUBCONTRACT AND LABOR

A. All provisions of these "General Provisions" shall apply to all subcontracts to the extent that they are applicable.

B. Architect's written approval shall be obtained for each subcontractor awarded any major subcontract. The Contractor will be held fully responsible for any acts or omissions of any subcontractors or suppliers.

C. Each Contractor shall have properly licensed employee for each specific trade on the job site at all times.

Plumbing: Licensed Master or Journeymen.
Electrical: Licensed Master or Journeymen.

1.29 WARRANTY

A. In addition to the warranties on the individual items of new equipment, this Contractor shall warranty all new equipment and workmanship for a period of twelve (12) months from the date of acceptance as defined in the Supplementary Conditions.

B. If within the warranty period, such equipment or work performed under this contract is found to be defective in material or workmanship, it shall be replaced or repaired free of any additional charges.

1.30 INTENT

A. It is intended that this specification provide a complete installation. All accessory construction and apparatus necessary and/or pertinent to the operation and testing of the work shall be included. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

PART 2 - PRODUCTS

2.01 STANDARDS FOR MATERIALS AND EQUIPMENT

A. It is the intention of these specifications to indicate a standard of quality for all materials and equipment incorporated in this work. Manufacturer's names and catalogue numbers are used to designate the item of equipment or material as a means of establishing grade and quality. Where several manufacturers are named, only those named will be considered and the Contractor's bid shall be based on their products. Named manufacturers, although acceptable as manufacturers, must prove their product will perform satisfactorily and will meet all requirements, etc.

B. Where the "or equal/or approved equal" clause is used in these specifications, the name, or names, mentioned are to be used as a basis of quality. Other manufacturers may be used if, in the opinion of the Engineer, the quality of the proposed material is equal to that of materials named. Such unnamed manufacturer's products will, however, be considered as substitutions and shall not be used as basis for bidding. Requests for such substitutions shall be made in writing, and require written approval of the Architect.

C. The term "no equal" in the specifications or on the drawings indicates that material and equipment shall be furnished exactly as specified.

D. The term "match existing" in the specifications or on the drawings indicates that material and equipment shall be exactly the same as existing, if available. If no longer manufactured, then it shall be similar in design and operation.

E. Basis of quality shall be interpreted to include material, workmanship, size, weight, finishes, gauges of material, appearance, performance, etc.

F. Manufacturer representation as to availability of equipment, parts and replacement and service personnel in the area will be a factor in consideration of submittal.

G. All materials shall be new, unless otherwise shown or specified, and of quality grade, standard manufacture and first class in every respect. Material shall bear the label of the NFPA, NEMA, U.L., AGA, etc. where such standard has been established for the particular item of equipment used.

H. Naming a manufacturer, brand, or model number as part or all of the description of manufactured items shall be deemed to include any description or specifications of such items in that manufacturer's catalogues, advertisements or other representatives. Should there be contradictions or variations in that manufacturer's literature currently available, the better quality of material or workmanship shall be furnished under this contract.

2.02 ELECTRIC MOTORS, GENERALLY

A. Electric motors shall be "high efficiency" design, and of the size, speed, phase, and voltage specified and of the type recommended by the motor manufacturer for the service intended.

B. Unless otherwise specified, all motors 1/4 horsepower and larger shall be designed for 50°C rise in 40°C ambient, provided with an open drip-proof frame, and shall have a guaranteed continuous capacity of 115% of rating. No motor shall be installed where the actual or projected imposed load exceeds 100% of rating. Motors provided for use with variable-frequency drives shall be specifically rated as suitable for that application.

C. Unless otherwise specified, all motors smaller than 1/4 horsepower shall be constructed to NEMA standards for service intended, the standard catalogued product of an approved motor manufacturer, and the type normally furnished by the equipment manufacturer as an integral part of his equipment.

D. Bearings for motors 1/2 horsepower and larger shall be 200,000-hour grease-lubricated ball bearings, conservatively rated for long life at maximum load conditions, and provided with alemite fittings. Motors in inaccessible locations shall have grease fittings extended to provide easy service.

E. Bearings for motors smaller than 1/2 horsepower shall be 10 year grease-lubricated, sealed ball bearings unless otherwise specified. (This requirement is not intended to prohibit a manufacturer from furnishing an approved different type of bearing that is standard with his equipment, subject to approval.)

F. Motors 1/2 horsepower and larger shall be NEMA Design B, with Class B insulation, and unless otherwise specified shall be 1750 RPM.

G. Motors smaller than 1/2 horsepower shall be provided with automatic reset thermal overload protection, and unless otherwise specified shall be 1750 RPM. Motor starting shall be capacitor type, except that split-phase starting may be provided for motors smaller than 1/6 horsepower.

H. Motors located in hazardous areas or driving equipment handling hazardous materials shall be explosion-proof. Motors exposed to the elements shall be rain tight. Motors subject to potential water damage (such as at pumps) shall be splash proof.

I. The nameplate horsepower of the driving motor shall be not less than the brake horsepower requirement of the driven machine. Motors over 40 horsepower shall be 6-lead type, suitable for wye-delta reduced voltage starters.

J. It is preferred that all motors be of the same manufacturer. All motors of the same horsepower rating, except those furnished as integral parts of factory assembled equipment, shall be of the same manufacture.

K. Except as otherwise specifically noted, all motors shall conform to the following:

1. Larger than 1/2 Horsepower:

   (a) 480 Volt or 208 Volt as indicated
   (b) Three Phase
   (c) 60 Hertz

2. 1/2 Horsepower and Smaller:

   (a) 120 Volt
   (b) Single Phase
   (c) 60 Hertz

L. Minimum acceptable efficiency and power factor ratings under full load conditions shall be rated in accordance with IEEE Standard 112 Test Method B, as follows:

HP	% Efficiency	% Power Factor
1	82	90
1.5	83	90
2	84	90
3	85.5	90
5	87	91
7.5	88	91
10	89	92
15	89.5	92
20	90	92
25	91	92
Larger	91	92

M. All HVAC fan motors greater than 5 horsepower shall meet minimum efficiency requirements of the current applicable version of the International Energy Conservation Code.

2.03 MOTOR STARTERS

A. Motor starters shall be provided for all motors associated with fans, pumps, etc., that are not part of package factory HVAC equipment having their own starting and control devices.

B. Starters for single phase non-electrically interlocked motors within fifty (50) feet developed length of the switching point shall be flush-mounted single or double pole switches as required, with red filament type pilot lights and stainless steel face plates, equal to "Allen Bradley" #500-TQX2l6, or "Square D" #FS-1P.

C. Starters for single phase electrically interlocked motors, single phase non-electrically interlocked motors more than fifty (50) feet developed length from the switching point and/or three phase 480 or 208 volt motors up through 40 horsepower, shall be one, two, or three pole, 60 Hertz, 600 volts, across the line magnetic contactors, with thermal overload protection on each phase when used with momentary contact pilot devices or under voltage release when used with maintained contact pilot devices.

D. Starters for 480 or 208 volt, 3 phase motors larger than 40 horsepower, shall unless otherwise noted, be 60 Hertz, part-winding reduced inrush increment magnetic contactors, with general purpose enclosure, thermal overload protection on each phase, and under voltage protection when used with momentary contact pilot devices or under voltage release when used with maintained contact pilot devices. Starters shall contain a definite adjustable time-delay relay to transfer from start to run connection.

E. Starters for voltages other than 120, 208 or 480 shall be as separately specified hereinafter.

F. All magnetic contactors shall have 120 volt holding coils, and those operating at voltages above 120 shall be furnished with individual control transformers.

G. All electrically interlocked starters shall be furnished with "hand-off-automatic" switches in the enclosure cover.

H. Starters installed outside the building, or otherwise exposed to the weather, shall be furnished with weather-resistant NEMA Type 3 enclosures, in lieu of general-purpose type.

I. Starters installed in hazardous locations or as otherwise indicated, shall be provided with Class 1, Groups C or D, NEMA Type 7 enclosures, in lieu of general-purpose type.

J. All starters of any one type shall be of the same manufacture.

K. Starters furnished as integral parts of factory-assembled pre-wired equipment, or special starters for large equipment, shall conform in general to the above requirements, as they may be applicable in the opinion of the Engineer.

L. Variable Frequency Drives (VFD): Variable speed motor controller starters shall be fully compatible with the motor(s) served so as to prevent frequency noise. Variable speed motor controller starters shall each be solid-state pulse-width-modulated type, factory-assembled and tested, UL labeled device, arranged to provide infinite control of alternating current frequency from at least as low as 6 Hertz to at least as high as 60 Hertz, in response to either an external signal (electrical or pneumatic, as appropriate) or a manually adjustable setpoint device in the event automatic control is not called for. Construction shall be similar and equal to "Reliance Electric" Model A-C V-S, and shall include but not be limited to the following:

1. Output contactor with overload protectors on each phase leg
2. 115 volt control transformer
3. Adjustable current limiter
4. Automatic shutoff devices
5. Line transient protection
6. Surge protection

7. Voltage, current, and frequency meters
8. Relay contacts as necessary for interlock and signal functions
9. Acceleration and deceleration at approximately 20 seconds
10. Starting torque at 100% full load torque
11. NEMA enclosure suitable to the installation location
12. Ground fault protection
13. Output short circuit protection
14. Output line filters
15. Manual bypass with magnetic contactors
16. Motor service disconnect with fused protection properly rated to motor served

2.04 PUSHBUTTON STATIONS

A. Except as otherwise specifically indicated, each pushbutton station shall be rated for 10 amperes continuous load at 600 volts or less.

B. Enclosures shall be general purpose NEMA Type 1, except that pushbutton stations installed outside the building or otherwise exposed to the weather shall be duct and weather tight, NEMA Type 7. Enclosures shall be provided for surface mounting, except as otherwise indicated.

C. Pushbutton stations for non-interlocked contactors shall be momentary-contact type with start button, stop button, and red indicator light. Where required for delayed "seal-in", or otherwise noted, pushbuttons shall be maintained contact type.

D. Pushbutton stations for electrically interlocked contactors shall be provided with "hand-off-automatic" selector switches, and both red and green indicator lights.

E. Pushbutton stations requiring other special features shall be provided as required or otherwise indicated.

2.05 DRIVES

A. Except as otherwise noted, motor drives shall be V-belt type, matched and provided with a slide rail base for mounting the driver.

B. Drives of 10 horsepower and under shall be rated at 1.2 service factor (120% maximum horsepower at the given drive speed). Drives above 10 horsepower shall be rated at 1.4 service factor.

C. Motor sheaves shall be adjustable-pitch for motors 7-1/2 horsepower and smaller, and fixed-pitch for larger motors.

2.06 SLEEVES

A. Unless otherwise indicated on the structural drawings, all pipe sleeves installed in the vertical position shall be constructed of 26 gauge galvanized steel. All pipe sleeves in the horizontal position shall be constructed of standard weight steel pipe or extra heavy cast iron pipe. Where sleeves pass through fire-rated partitions or floors, U.L. approved firestop system shall be used to seal up openings around pipe and sleeves. Firestop system shall be "Hilti" or approved equal.

B. Provide 2" high cast-in-place sleeves or curbs at all floor pipe and duct penetrations, caulked with steel wool and flexible sealant.

C. Refer to Architectural Specifications for additional firestop information and details.

D. All sleeves shall cover the full thickness of walls, floors, etc.

2.07 ESCUTCHEONS

A. Escutcheon plates shall be chrome-plated, cast-brass, setscrew held type, similar and equal to "McGuire" #127.

2.08 IDENTIFICATION OF PIPING AND EQUIPMENT

A. Stenciling shall be paint, as indicated, with letter sizes as appropriate or as directed by the Owner, but not less than 1" high.

B. Directional arrows shall be same color as stencil color.

C. For pipe identification, Contractor may use "Seton" SETMARK Type SNA snaparound pipe markers, or approved equal. Adhesive backed, stick-on pipe markers are not acceptable.

D. One set of metal interlocking stencil letters and numbers shall be turned over to the Owner at the completion of the job.

E. Nameplates for mechanical equipment, motor starters, contactors, etc., shall be 1/8" thick engraved laminated plastic type, "Setonite" or equal, drilled for bolting to the face of the respective enclosure. Letter sizes and arrangements shall be per details on the plans.

PART 3 - INSTALLATION

3.01 WORKMANSHIP

A. All workmanship shall, in all respects, be of the highest grade, and all construction shall be done according to the best practice of the trade. Work shall be done by mechanics experienced and skilled in the trade involved. All work shall be completed to the entire satisfaction of the Architect, and only when in a finished, undamaged and clean state.

B. Location of all pipes, ducts, outlets, equipment, appliances, etc., as shown on the drawings, are approximate only and are understood to be subject to such reasonable revisions as may prove necessary or desirable at the time the work is installed. Contractor will be required to install his work with relation to building conditions and shall be entirely responsible for the correctness of his work with reference to finish elevations, etc. Exterior utilities shown on the drawings are diagrammatic only and their exact locations, depth and invert elevations shall be as required for proper flow and coordination with other areas.

C. The drawings show the arrangement of piping and ductwork. Should project conditions indicate the piping or ductwork can be installed to better advantage in a different manner, the Contractor shall before proceeding with the work, prepare and submit five (5) copies of drawings of the proposed arrangement for the Architect's review and written approval.

D. Should the Contractor propose or intend to install equipment, including associated piping and ductwork, with unit sizes and space requirements other than those shown, Contractor shall submit five (5) copies of scaled drawings indicating proposed arrangement of equipment and systems, along with associated service clearances, subject to Architect/Engineer's review before doing any work. Acceptance of proposed arrangement does not relieve the Contractor's responsibility for meeting all required clearances, dimensions, etc., and carrying out all work in accordance with the full intent of the drawings and specifications.

E. Contractor is responsible for the proper location and size of all slots, holes or openings in the building structure pertaining to his work, and for the correct location of pipe sleeves.

F. This Contractor will be held responsible for the timely placing of all materials and equipment in a thorough, substantial and workmanlike manner.

G. Except for necessary connections to equipment and fixtures, Contractor shall not install piping of any kind exposed to view at the building exterior or in occupied spaces without Architect's permission. Where exposure is necessary, Contractor shall hold such work to a minimum, installed with good practice.

3.02 EXCAVATION AND BACKFILL

A. All excavation and backfill of all classes required to install work included in these sections of the specifications, shall be performed as a part of the work of this Contractor. No extra payment will be made for rock excavation. Trenches for all underground pipes shall be excavated to the required depths. The bottom of trenches shall be tamped hard and graded to secure maximum fall. Bell holes shall be excavated to assure the pipe rests for its entire length on solid ground. Trenches shall be excavated to a depth of twelve inches below the bottom of the pipe and, before laying the pipe, the space between the bottom of the pipe and the bottom surface shall be filled evenly and completely with pea gravel, 3/8” nominal aggregate, thoroughly tamped. Pipe laid in trenches dug in fill shall be supported down to load bearing undisturbed soil where possible. After the pipe has been tested and inspected, the trenches shall be filled. No rocks or foreign materials of any description shall be used in backfilling the trenches. The backfill material shall be deposited in layers at optimum moisture content and mechanically compacted to 90% of maximum density as determined in accordance with ASTM D698. The process shall be continued until trenches are backfilled. The Contractor at his expense shall haul all surplus materials from the project.

B. After the pipe has been tested and inspected, backfill shall be applied as detailed on the drawings for all trenches, ditches and openings around manholes, valves, boxes, hand holes, etc. Backfill material, moisture content, layering and compaction shall be in accordance with directions and recommendations under the Geotechnical Report and as required by other design authorities for this project, and in accordance with ASTM D698. No rock or foreign material of any description shall be used in backfilling the trenches. The process shall be continued until trenches are completely backfilled. The Contractor at his expense shall haul all surplus materials from the jobsite.

C. Where gravel streets, paved streets, parking areas, sidewalks, or any other paved, graveled or surfaced area is disturbed, cut or damaged during the installation of any underground work, the expense of repairing same in an approved manner suitable to the Architect, and as required by local ordinances, shall be included under the contract.

D. Underground lines shall be routed to miss trees and bushes as required. Yards, shrubbery, planting areas disturbed for the installation of underground services shall be repaired or replaced by the Contractor subject to the approval of the Architect.

E. Trenches for piping requiring joint makeup shall be sufficiently wide to provide working spaces.

F. Any sinking of surfaces over ditches, trenches, etc., including turf, paving, curbs, etc., during the guarantee period shall be repaired by the Contractor to the satisfaction of the Architect.

G. All excavating, trenching and backfilling shall be carried out in strict accordance with OSHA Trenching Standards, Geotechnical Report and other design authorities for this project. See Structural and Civil Drawings and Specifications for additional requirements.

3.03 RESPONSIBILITY OF WORK BY CONTRACTORS

A. The Mechanical Contractor shall furnish and install all new HVAC equipment, and furnish all motor starters, local factory thermostats, switches, pilot lights, and control panels as specified. The Mechanical Contractor shall set equipment in place and shall furnish the starters, etc., to the Electrical Contractor together with all necessary wiring diagrams and instructions. The Mechanical Contractor shall install all local thermostats and all local temperature control wiring and conduit for unitary HVAC equipment where indicated or specified for non-DDC control. The Mechanical Contractor shall also furnish and install all control interlock wiring, relays, etc., for direct interlock control of HVAC equipment assemblies.

B. All control wiring carried out by the Mechanical Contractor for local factory thermostat control of HVAC equipment shall be installed in conduit where concealed in walls or chases, or exposed. Wiring above ceilings will not require conduit but shall be plenum-rated cabling properly supported to structure. Wiring in existing walls shall run in existing conduit where present.

C. The Mechanical Contractor (via unit manufacturer) shall furnish and install at his expense prewired controller ports, contact connection points and/or terminals, as well as factory control transformers and relays, associated with any HVAC factory unit controllers required to accommodate DDC control as specified in Section 23 9000, as well as devices for any AHU, fan, pump, etc., applicable for control under this project, including magnetic contactors for three phase motors and relay contactors for single phase motors (and 120 VAC control transformers as required). The Mechanical Contractor shall also install all field control devices furnished by Automatic Control Contractor that are integral to mechanical distribution, such as control valves, control dampers (not factory furnished), immersion wells and couplings, etc.

D. The Electrical Contractor shall furnish and install all power wiring, and all direct equipment interlock control wiring, called for on the plans and/or otherwise required. The Electrical Contractor shall provide all electrical work supporting the DDC control system, including extensions of 120 volt power circuits and outlets, as directed by the Automatic Control Contractor and/or as specified under Section 23 9000. Electrical Contractor shall also provide and install all wall boxes and conduit within walls required for A/C system control devices and/or sensors (thermostats, etc.).

E. The Electrical Contractor shall furnish and install required disconnect switches for equipment. The Mechanical Contractor shall coordinate with the Electrical Contractor as to location of the disconnects so as to avoid damage to the equipment and preserve adequate access to all removable panels, etc., and shall furnish mounting brackets if and as required for a workmanlike installation.

F. The Automatic Control Contractor shall provide all DDC and EMS controls (thermostats, sensors, controllers, etc.), and all control wiring and components, LAN and communication wiring, and associated conduit except for wall boxes and conduit within walls (see Subparagraph D. above). Wiring shall be in accordance with applicable portions of DIVISION 26. Where equipment switching is integral with temperature controls, such wiring shall also be included under the Automatic Control Contract. All wiring and conduit associated with the DDC Energy Management System shall be included under the Automatic Control Contract.

G. Each applicable trade shall prepare a list of all electrical consuming items being installed in the project under this contract, which lists amps, volts, phase, etc., of each piece of equipment or electrical device. Such lists shall be formally transmitted to the Electrical Contractor, who shall verify electrical service provided to each item and who shall immediately notify the Engineer of any discrepancies before any work is carried out. Reasonable adjustments in branch service sizes, if required, shall be made without an addition to the contract amount. Coordination shall be completed prior to finalizing all equipment and material purchases which could be affected for this project.

H. The Fire Alarm Subcontractor shall furnish to the Mechanical Contractor all duct-mounted smoke detectors indicated or required (for smoke damper operation or A/C units and integrated systems over 2000 cfm) for installation by the Mechanical Contractor. The Fire Alarm Subcontractor shall then connect all such smoke detectors to his particular fire alarm apparatus and/or controlled equipment item. The various contractors shall carefully coordinate smoke damper operator requirements to insure the proper voltage is provided.

3.04 PRECAUTION AGAINST NOISE AND VIBRATION

A. The Contractor shall take the utmost precautions in the installation of his equipment, piping, and systems to prevent noise and vibration transmission.

B. Equipment that would tend to cause noise or vibration shall be isolated to prevent noise transmission to the building or to other equipment.

C. Piping, conduit, etc., connected to equipment shall be isolated. The Contractor shall be responsible for the prevention of noise and vibration transmission through his connections to equipment.

3.05 DRIVES

A. All sheaves shall be properly aligned.

B. Belts shall be installed with correct take-up allowance, and with equal tension on all belts of a set. Belts shall be readjusted as required after belts have been fully seated and "run-in".

C. Direct drive equipment shall be properly aligned. Flexible couplings shall not be used to compensate for misalignment. Factory aligned equipment shall be field checked for alignment. Alignment adjustments shall be made after grout has set, foundation bolts have been properly tightened, and all piping, conduit, and wiring have been connected.

D. Angular alignment shall be determined by inserting a tape gauge feeler at four points between coupling faces.

E. Dial indicators shall determine parallel alignment.

F. After each unit with drive couplings has been running for not less than one week, coupling halves shall be given a final check for misalignment caused by pipe or temperature strains. When alignment is proven correct, both the equipment and its driver shall be doweled to base plate.

3.06 SLEEVES

A. Oversize sleeves shall be provided for all lines and ductwork to pass full thickness, including insulation. Annular spaces shall be permanently sealed.

B. Unless otherwise detailed, where pipe extends through exterior walls below grade, oversize sleeves shall be used and the annular space between service pipe and sleeves caulked where required to make a waterproof joint.

C. Unless otherwise shown, all sleeves through walls shall be installed flush with finished surfaces and shall extend the full thickness of said walls, and all sleeves through suspended floors shall extend 2" above finished floor line. Sleeves in concrete construction shall be cast in place.

D. Where sleeves pass through fire-rated partitions or floors, approved fire stop materials shall be used to seal up opening around pipe and sleeves.

3.07 CUTTING AND PATCHING

A. The Contractor shall be responsible for all cutting and patching required for the proper installation of his work, and shall obtain permission from the Architect before doing any cutting. Cutting and patching shall be done in such a manner that the surrounding work will be restored to its original condition.

B. NO STRUCTURAL MEMBER MAY BE CUT WITHOUT WRITTEN PERMISSION FROM THE ARCHITECT, and then only where and as directed by the Structural Engineer. If a structural member is cut, the Contractor will be responsible for reinforcing the member as directed by the Structural Engineer.

C. When cutting and patching is done in occupied spaces within the building, the Contractor shall provide a dust-tight enclosure and any other necessary protection around his operation in order to protect equipment and finishes.

D. Openings cut through the roof or exterior walls shall be provided with a temporary watertight cover during construction or until equipment or repair has been made.

E. The General Contractor will provide chases as indicated on the drawings. Each Contractor shall be responsible for giving the General Contractor the correct sizes and locations of all such chases, slots, etc., in sufficient time that they may be built in as the building construction progresses.

3.08 PAINTING

A. The Paint Subcontractor shall paint materials and equipment not concealed. Painting shall be as specified in "Painting" Section of these specifications.

B. Items and materials shall be thoroughly cleaned of dirt and grease by this Contractor before application of paint.

C. Items with factory applied enamel painting shall be protected during installation and other construction work. Damaged factory applied finishes shall be repainted by the installing contractor. Scratches to factory applied finishes shall be sanded smooth before repainting.

D. All work performed under this contract shall be painted as hereinafter specified.

E. All insulated equipment not canvas covered, and all uncovered piping, hangers, ducts, equipment, iron work, etc., in finished rooms, including all mechanical equipment areas, or outside building where exposed to view, shall be painted one (1) coat of an approved metallic primer suitable for this class of work, and two (2) coats of semi-gloss paint, color as selected by the Architect. Ductwork visible in back of grilles shall be painted black. All uncovered work in concealed spaces above floor line, such as pipe chases or attics above ceilings shall not be painted.

F. All exposed canvas covered work, including that in all mechanical rooms or equipment areas shall be painted one (1) coat of approved sizing and two (2) coats of paint.

G. All other concealed canvas covered insulation, including that under floor, in pipe chases or attics above ceiling, shall be painted one (1) coat of sizing, and two (2) coats of "Talcote" #070, or equal asphalt emulsion damp-proofing.

H. All exterior above-grade gas piping and condensate drain piping shall be painted with one (1) coat of corrosion-resistant primer and one (1) coat of “Severe Service” paint.

3.09 IDENTIFICATION OF PIPING AND EQUIPMENT

A. Location and color of equipment stenciling shall be appropriate for ready identification, readable from a normal position standing on the floor, and/or as directed by the Engineer. Letter sizes shall be as approved by the Engineer, but not less than 1" high.

B. Nameplates shall be bolted to the face of the respective enclosure. Adhesive systems of attaching nameplates are NOT acceptable.

3.10 COOPERATION

A. Each Contractor shall cooperate with the General Contractor and all other Contractors to coordinate the respective work properly, avoid interference and delays, and to arrange all parts of the work so as to harmonize in service and appearance with all other parts.

3.11 INTERFERENCE

A. The plans are generally diagrammatic, and the Contractor must harmonize the work of the different trades so that interference between their work and the architectural and structural work will be avoided. All piping, ductwork, and electrical raceways shall be installed as close as possible to walls, floors, columns, ceilings, and beams, and offsets or special fittings shall be installed as required to accomplish this end whether or not shown on the plans.

3.12 PRECEDENCE

The mechanical and electrical work shall have precedence over each other in the following sequence:

A. Sanitary Waste & Vent Piping
B. Storm Drainage Piping
C. Drain Piping
D. Ductwork
E. Plumbing Water Piping
F. Fire Protection Piping
G. Gas Piping
H. Electrical
I. Control, Data and Alarm

3.13 HOISTS, SCAFFOLDS, AND TOOLS

A. Each Contractor shall provide or arrange for his own scaffolds, hoists, derricks, tools, and labor as necessary for the complete installation of the work under his contract.

3.14 TRADE RESPONSIBILITY

A. Except as otherwise specifically noted, it is not the intent of this specification to establish limits of responsibility between trades as to work which may or may not be performed under a subcontract to the Contractor awarded a contract for this project. The terms "the Contractor", "this Contractor", etc., shall in all cases be interpreted to mean the Contractor as defined in the GENERAL CONDITIONS.

3.15 ASBESTOS CERTIFICATION STATEMENT

A. It is the intent of all contract documents, whether expressly stated or not, that no material containing asbestos shall be incorporated into the project. Each Contractor shall exercise every reasonable precaution to insure that asbestos-containing materials are not incorporated into any portion of the project, including advising all materials suppliers and subcontractors of this requirement. At project closeout, each Contractor shall submit a certification that, to the best of his ability and knowledge, no asbestos-containing materials have been used.

3.16 LEAD FREE CERTIFICATION STATEMENT

A. It is the intent of all contract documents, whether expressly stated or not, that no material containing lead and having to do with potable water shall be incorporated into the project. Each Contractor shall exercise every reasonable precaution to insure that lead-containing materials are not incorporated into any portion of the project, including advising all materials suppliers and subcontractors of this requirement. At project closeout, each Contractor shall submit a certification that, to the best of his ability and knowledge, no lead-containing materials have been used.

3.17 ELECTRONIC COPIES OF CONSTRUCTION DOCUMENTS

A. The General Contractor may request, on behalf of himself and/or the Sub-Contractors electronic copies of the various sheets of the drawings. Please refer to Architectural Specification Section 01 3300 – Submittal Procedures for information on obtaining these files.

END OF SECTION

SECTION 21 1100

AUTOMATIC SPRINKLER SYSTEM PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

C. Refer to SECTION 21 1300 – AUTOMATIC SPRINKLER SYSTEM

1.02 SCOPE

A. This section of the specifications includes all labor and materials required for the complete and finished installation of the automatic sprinkler piping systems.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Valves, strainers, & unions
B. Insulation
C. Plumbing equipment and accessories
D. Plumbing fixtures
E. Fire protection equipment
F. Sleeves
G. Escutcheons
H. Excavation and backfilling
I. Heating and air conditioning equipment and accessories
J. Material storage and handling

1.04 SUBMITTALS

Submit manufacturer’s certified rating data, descriptive literature, and catalogue cuts for all proposed:

A. Valves
B. Strainers
C. Unions

PART 2 - PRODUCTS

2.01 PIPE

A. Underground water lines outside of building shall be AWWA C900, Class 200 PVC hub and spigot or mechanical joint water pipe; “Blue Brute” or equal.

B. Interior water piping:
   1. 1” to 3” - black steel conforming to ASTM A-135 and NFPA 13
   2. 4” and larger - black Schedule 40 steel

C. Interior water piping (roll-grooved fittings):
   1. 1” to 5” - Schedule 10 black steel
   2. 6” - black steel, 0.134” minimum wall thickness
   3. 8” to 10” - black steel, 0.188” minimum wall thickness

2.02 FITTINGS

A. With underground Class 200 PVC - Class 200 cast iron hub and spigot fittings, OR Class 200 AWWA cast iron mechanical fittings, stuffing box type with suitable gasket and thrust block at each elbow and tee.

B. With steel automatic sprinkler pipe:
   1. Up to 2-1/2" - 175# screwed sprinkler pattern fittings, black malleable iron or cast iron.
   2. 2-1/2" and Larger – Welded black steel, same weight as piping.

C. With steel automatic sprinkler pipe (roll-grooved fittings) - Pipe joined with grooved fitting shall be joined by a listed combination of fittings, gaskets, and grooves. Grooves shall be rolled on pipe with approved tools, and shall be dimensionally compatible with the fittings.

2.03 GROOVED MECHANICAL COUPLINGS/FITTINGS

A. Grooved mechanical couplings and fittings may be utilized for the automatic fire protection sprinkler system only.

B. Couplings and fittings shall all be of the same manufacturer and shall be similar and equal to “Victaulic”.

   1. Styles 77 or 75 couplings with Grade “E” gaskets or Style 31 coupling with grade “M” gasket
   2. Styles 741 and/or 742 flanges
   3. Style 750 reducing coupling
   4. Style 920 mechanical trees
   5. Style 72 outlet coupling
   6. Style 922 sprinkler connection

2.04 VALVES, STRAINERS AND UNIONS

A. All valves, strainers and unions shall have the name or trademark of the manufacturer and the guaranteed working pressure cast or stamped on the body, and all valves of any one type shall be of the same manufacture.

B. Unless otherwise specified or shown on the drawings, all valves shall be 125 psig, SWP, with sizes 2" and smaller screw or solder end, bronze body, and sizes 2-1/2" and larger flange end, iron body, or bronze trimmed.

C. Manufacturers' references given in the following table are to indicate a minimum standard of quality and design only.

	BRASS BODY	IRON BODY
1. Gate Valves, Rising Stem, 175# (Automatic Sprinkler)		
Crane		Fig. 467
Nibco	Fig. T-104-0	Fig. F-607RW

D. Unions 2" and smaller shall be 300 psig, S.W.P., malleable iron screw end, with bronze seat ring, similar and equal to "Crane" Fig. 198E. Unions 2-1/2" through 4" shall be 300 psig, S.W.P., three-part flanged unions, with self-seating bronze to iron ball joint, similar and equal to "Walworth" 8301.

E. Dielectric Pipe Fittings and Unions: All water piping with connections to dissimilar metals shall be provided with dielectric fittings/unions designed to meet the requirements of ANSI B16.39. All pipe threads shall be in accordance with ANSI B2.1 and solder joints shall meet national plumbing standards. Dielectric fittings/unions shall be similar and equal to "Watts" 3000 Series.

1. Gray Iron: ASTM A48-83
2. Malleable Iron Parts: ASTM A197-79
3. Steel Parts: ASTM A108
4. Brass Parts: ASTM B16
5. Bronze Parts: ASTM B584
6. Zinc Parts: ASTM B633-85
7. Insulators: Watts #1425

2.05 VALVE IDENTIFICATION TAGS

A. Valve tags shall consist of a bronze or brass disc not under 1-1/2" diameter, stamped with the prefix "P", "AC" or “FP” followed by an identifying number not less than 1/2" high, "Seton" #250-BL, or equal.

PART 3 - INSTALLATION

3.01 FIRE PROTECTION PIPING SYSTEM

A. An automatic wet sprinkler system shall be provided throughout the entire building. All work shall be in strict conformance with the City of Forney, Texas, Building Code, Texas State Board of Insurance, Factory Mutual, and NFPA 13.

B. Final layout drawings for all work described above shall be submitted for approval to all local and state agencies having jurisdiction, and to the Engineer, before installation.

C. The Utility Manager and Fire Marshall shall inspect all underground fire loop piping prior to covering up the work.

D. All water lines will have a (tracer wire only) to allow easy location of the water line. The tracer wire will be mounted on the outside of the building approximately 1 ft. above ground level. Where water enters under the building, use brass tag mounted to the building and tracer wire mounted to the brass tag.

3.02 PIPING, HANGERS, SUPPORTS, ETC., GENERALLY

A. All piping shall be installed parallel or perpendicular to the lines of the building, unless distinctly shown or noted on plans otherwise. Spacing of lines shall be such as to provide not less than 1" clearance between finished coverings on the various services.

B. This Contractor shall furnish all foundations, hangers, or supports for the work installed.

1. All suspended piping shall have supports not more than 5' on centers for sizes under 2", and not more than 10' on centers for sizes 2" and larger.

2. All vertical risers shall be supported at each floor with vertical riser clamps.

3. Supports at special conditions shall be as detailed on the plans.

C. Supports to walls shall be made with "Molly" bolts.

D. Perforated strap hangers shall not be used for any work.

E. Hangers for automatic sprinkler piping shall be adjustable swivel ring malleable iron similar and equal to "Anvil" Fig. 69. Except as otherwise specified, hangers shall be sized to fit the pipe.

1. Hangers shall be sized to fit the outside diameter of all insulated piping.

F. Trapeze hangers may be used for multiple parallel runs where specifically indicated on the plans, or elsewhere with permission of the Engineer.

G. All pipe openings shall be capped during construction. All steel pipe (except pre-insulated), before installation, shall be stood on end and pounded to remove dirt and scale, and all steel pipes shall be properly reamed before joints are made up.

H. All piping shall be installed so as to allow for expansion and contraction using offsets, expansion loops, swing joints, etc., as shown or as may be required to prevent undue strain on piping.

I. Pipe shall be cut accurately to fit. No bending or springing of pipe will be permitted.

J. All piping supports shall be connected to the top cord of joist or beam. Connection of supports to “X” bracing or cross support structural members is strictly prohibited.

3.03 PIPE JOINTS

A. Except as otherwise noted, joints in threaded piping shall be made only with "Jointite" or equal, applied on the male thread only. The ends of pipes shall be square cut, reamed, and wiped clean before being made up into fittings.

B. Joints in welded piping shall be made up with factory fabricated welding fittings as specified above which shall include all elbows, tees, laterals, reducers, etc., and shall be "Tube-Turn", "Taylor Forge", "Ladish", or "Crane" full radius type, except that tees may be formed for lines 4" and larger connecting to lines 6" and larger by saddling branch into side and main and connection of lines 1-1/2" and smaller into lines 2" and larger may be made with "Threadolets". All welding shall be done in accordance with standard practice utilizing only fully qualified welders, in accordance with Section IX of ASME Boiler and Pressure Vessel Code, and ANSI B31.1. All joints shall be smoothly fitted before welding, and welding rod shall be specifically suited to the pipe material. Flanges shall be weld-neck type, class to match valve, except #150 minimum.

3.04 VALVES AND STRAINERS

A. Valves, strainers, connections, etc., shall be provided wherever shown on the drawings, or required for controlling the various portions of the work, furnished by other trades or by the Owner, and including proper rough-in and final connection to such equipment. Isolation and controlling valves for every item of equipment shall be easily accessible from rooms or through access panels.

B. Valves, strainers, etc., shall be installed in such a way as to facilitate operation and maintenance. When installed in horizontal lines, valve stems, shall be vertically upward. Joints shall be made up as specified for the corresponding piping. All isolation valves and disconnecting means shall be located in such a manner that the isolated device (coil, tube bundle, etc.) can be physically removed and replaced without shutdown or interruption of the piping system to which connected.

3.05 UNIONS

A. No unions are to be placed in a location that will be inaccessible after completion of the building unless specifically shown on plans or specified otherwise.

B. Where joints are made up with bolted flanges or grooved mechanical couplings, separate union fittings as such will not be required.

3.06 VALVE IDENTIFICATION

A. The Contractor shall attach to the handle of each valve installed an identifying valve tag. Attachment of tag shall be by means of brass jack chain or brass "S" hook as appropriate for valve size.

B. Valve tags may be omitted when the function of the valve is completely obvious, of secondary importance, and immediately adjacent to and in plain sight of the equipment served.

C. All valve tag identification shall be indicated on the record drawings and a copy of the typewritten schedule shall be included in the operation and maintenance manual.

3.07 CLEANING, TESTING, AND ADJUSTING

A. It is the intent of this section of the specifications to provide for the thorough cleaning of the interior and exterior of all piping systems, and for all necessary tests during and at completion of the job to insure tight piping and correctly balanced systems. This Contractor shall do any and all work required to accomplish this end.

B. All fire protection piping shall be tested to a hydrostatic pressure of 200 psig at the lowest floor level, which pressure shall be maintained without pumping for a period of two (2) hours.

C. Pressure gauges shall be installed to confirm each piping test.

D. All motors, bearings, etc., on all equipment shall be correctly oiled and/or greased with proper lubricant before the equipment is operated, and again at completion of the job.

E. The Contractor shall conduct operating tests of all equipment and other apparatus installed by him to demonstrate to the Owner and the Engineer the satisfactory operation of same and the fulfillment of the specified requirements. He shall make any additional tests that may be required by other authorities.

END OF SECTION

SECTION 21 1300

AUTOMATIC SPRINKLER SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

C. Refer to SECTION 21 1100 – AUTOMATIC SPRINKLER SYSTEM PIPING.

1.02 SCOPE

A. This section of the specification includes all labor and materials required for the complete and finished installation of fully automatic wet-pipe sprinkler systems, and related fire protection equipment, detection devices, wiring and controls per NFPA 13.

B. This is a performance specification and the Contractor is hereby advised that any additional equipment, detection devices, wiring, parts and labor shall be furnished as required to provide a proper and satisfactory fire protection system at no additional cost to the Owner.

C. Water flow information was not available at time of printing. The Fire Protection Subcontractor shall be responsible for obtaining the actual flow and pressure of the new water main and adjust the calculations of pipe sizes and equipment as required for final fire sprinkler system to be approved by the Engineer and City Officials.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Piping
B. Valves, Strainers and Unions
C. Sleeves
D. Escutcheons
E. Excavation and Backfilling
F. Fire Extinguishers (in fire extinguisher cabinets)
G. Material Storage and Handling

1.04 SUBMITTALS

Submit manufacturer's certified rating data, descriptive literature, and catalogue cuts for all proposed equipment items as follows:

A. Sprinkler heads
B. Siamese connection
C. Alarm check valves
D. Backflow preventers

E. Water motor gong
F. Ball-drip valves
G. Shop drawing of entire system: Drawings shall be approved by the Authority Having Jurisdiction (AHJ) and bear the signature of the Fire Marshal or his agent, prior to submitting to the Architect for review.

PART 2 - PRODUCTS

2.01 SPRINKLER HEADS

A. Sprinkler heads in finished ceilings shall be semi-recessed type with chrome-plated finish; "Reliable" G/F1, or equal.

B. Sprinkler heads in certain areas with exposed steel structure (non-residential occupancy) shall be "Reliable" J112, or equal pendant and/or upright type.

C. Sidewall sprinkler heads shall be “Reliable” DH56, or equal.

D. All sprinkler heads shall be U.L. listed, F.M. approved, and rated in accordance with NFPA 13.

E. A metal cabinet containing the required number of spare sprinkler heads of each type and a sprinkler wrench for each type of head shall be furnished and wall-mounted as directed.

F. Sprinkler heads not located in finished ceiling shall be provided with wire protective guards including sprinkler heads in Gymnasium areas.

G. Provide two (2) cases (24 per case min) of additional sprinkler head attic stock for each type of head provided for the project.

H. Provide one (1) case of sprinkler head escutcheons for attic stock.

2.02 FLEXIBLE SPRINKLER HEAD CONNECTIONS

A. Contractor may use “flex” stainless steel head connections in lieu of hard-piped. Sprinkler head connection shall be similar or equal to “Flexhead” commercial fire sprinkler connections, FM approved, UL listed, Type 304 stainless steel flexible hose, ceiling mounting bracket, and 175 psi pressure rating.

2.03 SIAMESE CONNECTION

A. Fire department connection (FDC) shall each be a chrome-plated “Croker” Fig. No. 6368, or equal cast brass 5” “Storz” standpipe connection type. A cast brass escutcheon plate shall have raised letters with the designation indicated on the plans. Finish shall be polished chromium plate. Provide four (4) 4" pipe bollards and 4" thick concrete pad around standpipe.

2.04 BACKFLOW PREVENTERS

A. Full line-size backflow preventers for the main fire service shall be U.L. and F.M. approved double-check assembly with FDA strainer and entering and leaving OS&Y shutoff valves; "Watts" Series 709, or equal. Backflow preventers shall be as approved by the city fire department.

2.05 MOTOR GONG

A. Water motor gong shall be an approved wall-mounted alarm device to indicate sprinkler system actuation by means of water flow only. Finish shall be natural aluminum, unpainted.

2.06 BALL DRIP

A. Ball drip valves shall be "Elkhart" No. 701, "Allenco" No. 2112, or approved equal cast brass automatic type.

2.07 ALARM CHECK VALVE

A. Alarm check valve shall be iron body differential type for actuation of the water motor gong, complete with retard chamber, gauges, test, bypass, and drain valves.

2.08 CONNECTIONS AND RATINGS

A. All sprinkler and related equipment shall be U.L. listed and rated in accordance with NFPA 13. All hose connections shall meet all local fire department standards and regulations.

PART 3 - INSTALLATION

3.01 INSTALLATION PROCEDURES

A. All sprinkler work shall be provided as indicated on the plans and installed in strict conformance with the Authority Having Jurisdiction and with NFPA 13 for Light Hazard occupancy, Ordinary Hazard Occupancy, as required.

B. Sprinkler head locations throughout the building shall be as required by NFPA 13 and/or as directed. Sprinkler risers and valve locations shall be as shown on the plans and required by NFPA or Authority Having Jurisdiction.

C. Sprinkler line sizes and layout shall be per NFPA 13 criteria and hydraulically calculated. Pipe routing shall be coordinated with other services and/or as directed for maximum concealment and minimum interference.

D. Sprinkler system contractor shall be a licensed contractor by the State of Texas and registered with the Authority Having Jurisdiction.

E. Contractor shall coordinate all sprinkler system work and equipment location with the Architect and local Fire Marshal.

F. All sprinkler heads shall be centered in ceiling tiles.

G. Fire main service shall be provided with a backflow preventer assembly where indicated and/or as required by the city fire department.

3.02 REVIEW

A. Final layout drawings for all work described above shall be submitted for approval to all local or state agencies having jurisdiction, and to the Architect, before installation.

B. Contractor shall provide the Authority Having Jurisdiction, Fire Marshal, and Reviewing Agency with two (2) sets of final approved sprinkler system plans.

END OF SECTION

SECTION 22 0700

PLUMBING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

C. Refer to SECTION 21 0100 – WORK IN EXISTING BUILDINGS.

1.02 SCOPE

A. It is the intent of this specification that all piping, ductwork, mechanical equipment, and/or associated appurtenances connected thereto shall (except for obvious functional reasons or where otherwise specifically excepted herein) be insulated whenever the exterior surfaces are or can be:

1. Above 125^{O}F
2. Below average ambient dew point

1.03 QUALITY ASSURANCE

A. The Contractor shall cover all piping and apparatus as specified hereinafter or otherwise required with insulation as manufactured by "Manville", "Armstrong", "Owens Corning", “Schuller”, or equal.

1.04 WORK SPECIFIED ELSEWHERE

A. Factory-applied insulation of equipment

1.05 SUBMITTALS

Submit manufacturer's certified rating data and descriptive literature for all proposed:

A. Pipe insulation
B. Pipe insulating fitting covers
C. Mastic and sealants

1.06 INSULATION NOT REQUIRED

No field-applied insulation will be required for the following:

A. Natural gas piping.

B. Fire protection piping.

C. EXCEPTION: Any installed surface within the building, insulated or not, found to be above 125°F or found to be condensing moisture when in normal operation during average ambient humidity conditions, shall receive supplemental insulation sufficient to eliminate the problem, as directed.

PART 2 - PRODUCTS

2.01 PIPE INSULATION

A. All potable cold and hot water supply and return lines, all interior roof drain lines, and horizontal runs of sanitary waste piping suspended above ceilings which carry HVAC unit condensate drainage (except underground or exposed chrome-plated piping) shall be insulated with a molded sectional glass fiber insulation (4 lb./c.f. nom. density) with an "ASJ" vinyl-coated and embossed vapor-barrier laminated jacket. Fittings, valves, etc., shall be insulated with wrapped glass fiber material and finished with "Zeston" or equal PVC fitting covers. Insulation shall have a minimum thermal conductivity (K-Value) of 0.24 per inch at 75°F. Insulation thickness shall conform to the following:

Service	Thickness
Drain	1”
Cold Water	1"
Hot Water, up to 2"	1"
Hot Water, 2½” and up	1½”

B. Rigid urethane insulation may not be used in lieu of glass fiber.

C. Equipment and component drain lines shall be insulated with 1/2" "Armstrong Armaflex" or "Fiberglas O.C." flexible foamed plastic tubing except condensate drain lines run within HVAC supply/return plenums shall be insulated with 1/2" thick fiberglass as previously described for potable water.

2.02 FIRE AND SMOKE RATINGS

All insulation and insulation jackets (except foamed plastic and PVC covers) shall have UL Pipe and Equipment Covering rating RSS83 U8.15, not to exceed:

A. Flame Spread 25
B. Fuel Contributed 50
C. Smoke Developed 50

PART 3 - INSTALLATION

3.01 PIPE INSULATION

A. Glass Fiber Insulation: The sections shall be applied to dry pipe and secured with the self-sealing butt and longitudinal lap of the jacket. Fittings, valves, etc., shall be wrapped with glass fiber material to an equivalent thickness and density to the pipe insulation, and finished with PVC covers installed as directed by the manufacturer.

B. Foamed Plastic Insulation: On pipe or tubing not yet installed, unslit flexible tubing shall be slipped over the full length of the piping or tubing leaving a sufficient amount of exposed piping for connections. After connections are made and tested, insulation shall be applied over fittings so as to cover all piping completely. Slit insulation shall be used on systems that are to be insulated after installation. All butt joints and slit insulation shall be sealed with "Armstrong" 520 adhesive. Insulation exposed to the weather shall be finished with two (2) coats of "Armstrong" Weather-Proof Plastic or equal, reinforced with a layer of glass mesh embedded in the first coat while wet.

C. Insulation at strainers for potable hot and cold water lines shall be neatly terminated at the basket removal flange, so as to permit strainer servicing without damage to the insulation.

D. Protective metal 180^{o} shields of galvanized steel, in sizes and gauges as listed below, shall be installed on the lower half of all insulated lines, at each support point, and secured with two (2) copper or aluminum wires or bands.

PIPE SIZE	GAUGE OF METAL	LENGTH OF SHIELD
1/2" - 2-1/2"	18	6"
3" - 5"	16	10"
6" - 8"	16	14"
10" - Up	16	18"

3.02 INSTALLATION, GENERALLY

A. All sectional covering shall finish round and smooth without lumps or depressions, and all ends and joints shall butt evenly and tightly together and to the covered surface. No damaged or broken sections shall be used. Blocking shall be provided at pipe supports in all pipe insulation exposed in occupied spaces, as required to eliminate crimps or depressions. When covering is formed from blocks, they shall be carefully and evenly applied, securely wired in place, and joints shall be closed with cement insulation.

B. All insulated lines passing through walls or floors shall be provided with metal sleeves large enough to pass a full thickness of insulation.

C. After being painted as specified elsewhere, any insulation showing signs of coming loose or tendencies of the cloth pulling shall be removed and reapplied.

D. The application of all insulation shall be made strictly in accordance with the manufacturer's directions and by experienced craftsmen in a neat, careful, and workmanlike manner. All unsightly or sloppy work will be rejected.

E. Vapor-barrier and finish shall be continuous at all supports and wall penetrations.

F. All exposed surfaces of insulated piping exposed to the weather shall be finished out with a .016 mil. aluminum jacket secured with ½” bands and clips on 12” centers, sealed as required.

END OF SECTION

SECTION 22 1000

PLUMBING PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

1.02 SCOPE

This section of the specifications includes all labor and materials required for the complete and finished installation of the following piping systems:

A. Sanitary Drainage
B. Storm Drainage
C. Sub-Soil Drainage
D. Indirect Drainage
E. Potable Hot and Cold Water
F. Natural Gas

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Valves, strainers, & unions
B. Insulation
C. Plumbing equipment and accessories
D. Plumbing fixtures
E. Fire protection equipment
F. Sleeves
G. Escutcheons
H. Excavation and backfilling
I. Heating and air conditioning equipment and accessories
J. Material storage and handling

1.04 SUBMITTALS

Submit manufacturer's certified data, descriptive literature, and catalogue cuts for all proposed equipment items as follows:

A. Cleanouts
B. Traps and drains
C. Hubless pipe fittings
D. Pipe materials and fittings for each type system

PART 2 - PRODUCTS

2.01 PIPE

Pipe for the various systems shall conform to the following:

A. Sanitary Waste, Drain, and Vent Piping:

1. All gravity flow piping inside or below floor to points five (5) feet outside the building, except as otherwise noted – Schedule 40 polyvinyl chloride (PVC) Type DWV per ASTM-D-3965 and conform to the National Sanitation Foundation (NSF) Standard 14.

2. All exterior below grade piping beginning five (5) feet outside the building – SDR35 heavy wall PVC sewer pipe, hub and spigot type, per ASTM D3034.

3. Any size exposed within a finished room or installed in locations not having sufficient space to conceal completely all parts of pipe and fittings or hard drawn copper tubing, shall be heavily chromium plated where exposed to view.

B. Roof Drain Piping:

1. All gravity flow piping inside or to points five (5) feet outside the building, except as otherwise noted – Schedule 40 polyvinyl chloride (PVC) Type DWV per ASTM-D-3965 and conform to the National Sanitation Foundation (NSF) Standard 14.

2. All exterior below grade piping beginning five (5) feet outside the building – SDR35 heavy wall PVC sewer pipe, hub and spigot type, per ASTM D3034.

C. Sub-Soil Drain Piping:

1. Perforated – “Advance Drain Systems” (ADS) single wall coil type with fabric sock – ASTM F-405.

2. Solid – Same as specified for roof drain piping in Paragraph B. above.

D. Indirect Drain and Condensate Drain Piping:

1. Type “L” drawn copper.

E. Potable Hot and Cold Water Piping:

1. Domestic underground service lines outside buildings and entering buildings to points one (1) foot above floor slabs on fill grade (limited to domestic service entering the building) - AWWA C900 Class 200 (DR-14) PVC hub and spigot or mechanical joint water pipe.

2. Within building, above ceilings and beneath suspended floors or crawl space: Type "L" hard drawn copper tubing.

3. Within building, below slabs on grade: Type "L" soft copper tubing, with no below grade joints.

4. All Copper piping run below for shall be sleeved in such a manner so as to replace the piping in a convenient manner.

F. Gas Piping:

1. Above ground: black Schedule 40 steel.

2. Below ground: polyethylene plastic gas pipe conforming to ASTM-D-2513-66T and ASTM-D-1248-65T.

G. Any size piping exposed within a finished room or installed in locations not having sufficient space to conceal completely all parts of cast iron pipe and fittings or hard drawn copper tubing, shall be heavily chromium plated where exposed to view.

2.02 FITTINGS

Fittings for the various systems shall conform to the following:

A. Sanitary Waste, Drain, and Vent Piping:

1. With Schedule 40 PVC pipe: Polyvinyl Chloride Type DWV per ASTM D-2661 with solvent weld joints per manufacturer's direction.

2. With SDR heavy-wall sewer pipe - reinforced hub and spigot fittings of same material as pipe, per ASTM D3034.

B. Roof Drain Piping:

1. With Schedule 40 PVC pipe: Polyvinyl Chloride Type DWV per ASTM D-2661 with solvent weld joints per manufacturer's direction.

C. Sub-Soil Drain Piping: PVC or neoprene preformed fittings or couplings.

D. Indirect Drain and Condensate Drain Piping:

1. Within Building: Wrought copper, pressure type, solder joint fittings, same class as pipe.
2. Exterior Condensate Drain Piping on Roof: CPVC fittings with solvent weld joints.

E. Potable Hot and Cold Water Piping:

3. With Class 200 PVC Piping - Class 200 AWWA cast iron hub and spigot fittings, OR Class 200 AWWA cast iron mechanical fittings, stuffing box type, with suitable gasket; and with concrete thrust block at each elbow or tee.

4. With copper pipe - wrought copper, pressure type, solder joint fittings, same class as pipe.

5. Copper Press-Connect Fittings: Fittings shall conform to the material and sizing requirements of ANSI/ASME B16.18 or ANSI/ASME B16.22. All lead-free wrought copper press fittings shall be made from commercially pure copper mill products per ASTM B 75 Alloy C12200. Manufacturer's fittings must be certified by IAPMO to the PS-113 Standard. These fittings shall be third party certified to NSF/ANSI 61 and NSF/ANSI 372. Lead-free cast dezincification-resistant (DZR) fittings shall be made from a high quality lead-free performance bronze alloy per ASTM B 584 Alloy C87850. The press fittings connections shall be compatible with seamless K, L or M copper tube made to ASTM B 88. Fittings shall have a maximum non-shock working pressure of 200 psi between the temperatures of -20°F and +250°F. O-rings for the copper press-connect fittings shall be EPDM with leak detection design. All fittings, valves and tools shall be provided by the same manufacturer. Acceptable manufacturers are "Apollo Press" and "Viega".

F. Gas Piping:

1. Above ground:
   a. 2" I.P.S. and larger, welded black steel same weight as piping.
   b. Under 2" I.P.S., standard weight black malleable iron screw type fittings.

2. Below ground: Heat fused socket type for all below grade fittings.

3. Carbon Steel Press Connect Fittings – ½" through 2". Fittings shall conform to CSA/IAPMO LC-4 and ICC-ES PMG1036. Fittings shall be equal to ASTM A-106 Grade A carbon steel with zinc-nickel coating and designed for use with IPS Schedule 10 through Schedule 40 carbon steel or galvanized pipe conforming to ASTM A53, ASTM A106, ASTM A135, or ASTM A795. Fittings shall have an HNBR sealing element, 420 stainless steel grip ring, 304 stainless steel separator ring, and yellow color-coded press indicator rings. Fittings and valves must be of same manufacturer. Acceptable manufacturer: "Apollo Power Press" and "Viega".

2.03 FERRULES

A. All ferrules shall be of the best quality, extra heavy cast brass not less than 4" long and of weight and size as follows:

I.D.	LENGTH	WEIGHT
2-1/4"	4-1/2"	1# - 4 oz.
3-1/4 "	4-1/2"	1# - 14 oz.
4-1/4"	4-1/2"	2# - 8 oz.

2.04 PIPING DEVICES

A. The following specifications for piping devices such as cleanouts, traps and drains, and downspout nozzles, represent the minimum standard of quality required for this project. Equivalent styles and types of devices furnished by the following manufacturers will be acceptable:

1. Josam
2. Zurn
3. J.R. Smith
4. Wade
5. Watts

2.05 CLEANOUTS

A. Cleanouts, except at traps and fittings on horizontal branches shall be of same material and of same size as pipe up to 4" and 4" size for all larger pipe.

B. Cleanouts in steel piping shall consist of a threaded drainage fitting, with an extra heavy cast brass or bronze raised head screw plug, "Josam" 58540-20 or equal. Where concealed behind finished wall surfaces, a cast "Nikaloy" round flush cleanout access cover with polished top, anchor lugs, and vandal-proof cover securing screws, "Josam" 58600-CP-VP or equal, shall be provided also.

C. PVC plugs located within wall are prohibited.

D. Cleanouts in PVC piping shall be constructed with wye fittings, sweep elbows and screw plugs. Where clearance is limited, or where otherwise permitted by the Architect, such cleanouts may be tapped tee branch type with raised head screw plug.

1. Cleanouts in PVC piping, not occurring in finished floors or walls, shall have raised head screw plugs, "Josam" 55000-22 or equal. Where cleanouts are tapped tee branch type, screw plugs shall be raised head type with tee and cover for wall, "Josam" 58600-CO-20 or equal.

2. Cleanouts in PVC piping in finished walls shall be similarly constructed, but provided with brass raised head screw plug, and stainless steel round flush access cover with polished top, anchor lugs, and cover plate secured to plug by countersunk vandal-proof screw, "Josam" 58600-CO-2-VP or equal.

3. Cleanouts in PVC piping in finished floors (except where floor is terrazzo or carpeted) shall be similarly constructed as to piping, but provided with "Josam" 55000-1-22-VP or equal cast "Nikaloy" round flush cleanout, with flanged rim, anchor lugs, and inside caulk connection.

4. Cleanouts in PVC piping in terrazzo floors shall be similarly constructed as to piping, ferrule, and plug, but provided with a "Josam" 55000-1-13-1-22-VP or equal cast "Nikaloy" round terrazzo floor access frame and cover, secured with vandal-proof screws.

5. Cleanouts in PVC piping in carpeted floors shall be similarly constructed as to piping, but provided with caulking ferrule, threaded extra heavy brass or bronze screw plug, adjustable height cover section with heavy-duty scoriated cover, "Josam" 55000-14-22-VP or equal, and with "Josam" 1-1/4" diameter "Nikaloy" carpet marker with vandal-proof screw.

6. Cleanouts in kitchen Areas shall be approved for a sheet flooring systems.

E. Exterior cleanouts, unless otherwise specifically noted, shall be brought up flush with paving in paved areas, or encased in an 18" x 18" x 6" reinforced concrete pad flush with grade in unpaved areas, and terminated with an extra heavy cast iron caulking ferrule having an extra heavy cast brass or bronze countersunk head screw plug, "Josam" 55000-1-SD.

2.06 TRAPS AND DRAINS

A. P-traps shall be placed under all floor drains and at other points indicated on the drawings, or otherwise required. P-traps in cast iron piping shall be service weight cast iron hub and spigot pattern with trap primer. Where so noted, traps shall be "deep seal" type, with seal not less than 4" for 2" size or not less than 5" for larger sizes.

B. Floor drains in mechanical rooms shall (except as otherwise specifically noted) be "Josam" 321000-81-1-50, "Zurn" ZN-550-Y-P, "Wade" W-1310-TD-NB, or equal cast iron round drain, with double drainage flange, weep holes, inside caulk bottom outlet, flashing clamps, loose set heavy duty nickel-bronze grate, and removable sediment bucket, with trap primer.

C. Floor drains in the kitchen area shall be "MIFAB" F1100-FC, "Zurn" Z-400H-6/9H, "Wade" 100-FC6/9, or equal membrane clamping type cast iron round drain, with double drainage flange, weep holes, inside caulk bottom outlet, flashing clamps, allen screw vandal resistant, round duty nickel-bronze grate, and trap primer.

D. All other floor drains and all shower drains shall be "Josam" 30000-91-VP-50, "Zurn" Z-400-S-B-VP-P, "Wade" or equal cast iron floor drains with double drainage flange, weep holes, inside caulk bottom outlet, and square adjustable nickel-bronze strainer. Strainers shall be provided with vandal-proof screws, with trap primer.

E. All sanitary floor sinks shall be “Josam” 49360AS-NB-55 or equal, with acid-resisting interior, double drainage flange, dome strainer, and anti-tilt grate, with trap primer (half grate where noted).

F. Roof drains shall be “Josam” 21500-AE-22-3, or equal, cast iron round roof drain with cast iron dome, large sump with anchor flange, clamp ring, under-deck clamp and bottom outlet inside caulk connection.

G. Emergency overflow roof drains shall be “Josam” 21500-AE-16-22-3, or equal, cast iron round roof drain with cast iron dome, internal water guard for 2” depth, large sump with anchor flange, clamp ring, and bottom outlet inside caulk connection.

2.07 DOWNSPOUT NOZZLES

A. All downspout nozzles shall be “Josam” Series 25010, cast downspout nozzles, loose wall flange, threaded connection with satin bronze finish.

PART 3 - INSTALLATION

3.01 SANITARY DRAINAGE SYSTEMS

A. This Contractor shall furnish and install the various systems of sanitary drainage indicated on the plans. Each shall be complete soil, waste, and vent systems for all closets, lavatories, sinks, urinals, drinking fountains, electric water coolers, floor drains, etc. Waste and vent piping shall be sized as shown on the plans, and arranged to give proper drainage and venting for each fixture. All work shall be done in strict accordance with currently adopted codes (i.e., Uniform or International Plumbing Code, etc.), which shall be followed in case of conflict with the plans.

B. Soil, waste, drain, and vent piping within the building shall be given a uniform grade of 1/4" per foot wherever possible, but in no case less than 1/8" per foot (limited to 3” and larger). All exterior piping shall be installed to the flow lines indicated on the plans, and laid with 12" earth cover, minimum. Contractor shall verify all levels between the building and main sewer at the beginning of the job, and if the specified grades cannot be maintained, the Architect shall be so informed before proceeding with the work.

C. All soil, waste, and drain pipes shall be extended full size as vent pipes to above the roof lines as shown. Where so indicated, or elsewhere with the approval of the Architect, two or more vent risers may be connected in roof space and vents extended through roof. Each riser extended through roof shall project at least 15" above roof line and shall be thoroughly flashed with 4 lb. lead flashing turned down inside vent stack, and extended under roofing not less than 12" in all directions from vent pipe. Vent risers smaller than 2" shall be provided with approved brass vent caps in lieu of turning flashing down into pipe.

1. Contractor shall take care to coordinate vent riser locations through roofs with A/C outside air intakes as required to maintain a minimum separation of at least fifteen feet (15’) where possible, and in no case less than ten feet (10’). Necessary offsets of vent lines shall be provided to meet this requirement whether or not indicated on the drawings at no additional cost.

2. For flat roof areas with parapets, the top discharge of all vent lines through roof shall be set at top of parapet, but in no case less than 15” above the roof line. Taller vent stacks shall be provided with proper supports and flashing as required by the Roofing Contractor.

3. For hip roof construction, all vent risers through roof shall be located on the back side of the roof ridge where possible.

4. Upon request by the Owner, Contractor shall be prepared to furnish and install “Sweet Filter II” vent filters at designated vent stacks as may be found necessary to eliminate sewer gas odors from re-entering the building. Installation of up to five (5) vent filters shall be included in the Contractor’s bid.

D. The soil, waste, drain, and vent piping shall be provided with cleanouts to make all sections of the system accessible. Cleanouts shall be provided at the ends of change in direction of all drain, soil, and waste pipes and branches thereof, at the foot of each riser, at all offsets, in horizontal runs at approximately 60' intervals and 100’ intervals outside the building, and at other points where indicated on the drawings or where required. Two-way cleanouts shall be provided at the discharge of grease traps.

E. All trenching for soil, waste, or drain lines shall be graded so that the pipe rests on 12" sand base. Sand base shall be tamped to the satisfaction of the Architect. Trenching shall have bell holes at each joint, to allow body of pipe to rest on ground and to provide space for joint makeup. All drain inlets shall be covered and suitably protected from tile slurry, dirt, debris, etc., during construction. Wash down of such materials into building drain inlets is strictly prohibited.

F. Contractor shall provide cleanout below every sink and urinal.

3.02 STORM DRAINAGE SYSTEMS

A. This Contractor shall furnish and install the various interior and exterior systems of storm drainage, except as otherwise indicated on the drawings.

B. Installation requirements regarding cleanouts, grading, depth of cover, excavation, etc., shall be the same as specified for sanitary drainage systems.

3.03 SUB-SOIL DRAINAGE SYSTEM

A. This Contractor shall furnish and install the various sub-soil drainage systems indicated on the drawings. All systems shall be complete with sand cushion, gravel, backfill, etc., as detailed.

3.04 INDIRECT DRAINAGE SYSTEMS

A. This Contractor shall furnish and install all drain lines from HVAC and plumbing equipment and components, equipment furnished by the Owner or under this or other contracts, to floor drains, etc., as indicated on the plans or otherwise required. Clear air breaks in accordance with local code requirements shall be maintained at points of discharge.

B. Cleanout shall be provided at the leading end of each condensate run.

C. All exterior condensate piping on the roof shall be painted with exterior protective paint.

D. Installation requirements regarding grading shall be the same as specified for sanitary systems.

E. Refer to HVAC drawings and details for layout of condensate and indirect drain piping associated with HVAC systems.

3.05 POTABLE WATER SYSTEMS

A. This Contractor shall furnish and install the various potable hot and cold water systems as indicated on the plans. Systems shall be complete from points of connection to mains as indicated through or to the various equipment items furnished by the Owner, or under this or other contracts, and to points of connection with all plumbing fixtures or other outlets requiring same.

B. All interior piping will be graded for gravity drainage toward main supply risers or to fixture connections, to allow complete drainage of all parts of the system.

C. Underground piping shall be laid with 36" minimum cover to finished grade.

D. All connections of water piping to equipment or to piping of dissimilar metals shall be made with dielectric isolating couplings.

E. With press fitting systems, Installation training shall be provided on-site by manufacturer personnel and documented with Engineer or safety director. Installation procedures, depth guides, and tool inspection shall be provided by manufacturer for all product types (steel or copper) for reference and safety assurance.

3.06 GAS DISTRIBUTION SYSTEM

A. This Contractor shall furnish and install as indicated on the drawings the various gas distribution systems from point of connection to the utility service line to all fixtures and equipment requiring same.

B. Gas service piping shall enter the building not less than 4" above exterior finish grade with plug cock, and no gas piping shall be run under floors on fill. A dirt leg shall be provided upstream of service valve prior to entry into the building.

C. Gas service piping to each equipment item shall be provided with a dirt leg upstream of each gas regulator. Each regulator outlet shall also be provided with a test tee with nipple and cap.

D. All underground service lines shall be laid at least 18" below grade at all points.

E. All #18 copper tracer wire or other approved materials shall be installed with and attached to underground non-metallic gas piping and shall terminate above grade at each end.

F. All pipe penetrations through exterior construction (walls, roof) shall be provided with properly ventilated sleeves to the outside.

G. Provide a minimum of 6” from bottom of pipe to finished roof surface and painted “yellow” in color to match in finished areas where exposed. Do not paint regulators.

H. The use of compression type fittings is prohibited.

I. No gas piping shall be installed under the building structure.

J. Stop and test ports shall be installed on each side of all gas pressure regulators on the roof.

K. With press fitting systems, Installation training shall be provided on-site by manufacturer personnel and documented with Engineer or safety director. Installation procedures, depth guides, and tool inspection shall be provided by manufacturer for all product types (steel or copper) for reference and safety assurance.

3.07 PIPING, HANGERS, SUPPORTS, ETC., GENERALLY

A. All piping shall be installed parallel or perpendicular to the lines of the building, unless distinctly shown or noted on plans otherwise. Spacing of lines shall be such as to provide not less than 1" clearance between finished coverings on the various services.

B. This Contractor shall furnish all foundations, hangers, or supports for the work installed.

1. All suspended drainage piping shall have supports not more than 5’ on centers. All horizontal runs of cast iron or PVC waste and vent piping with no-hub couplings or solvent weld joints shall include supports immediately on either side of each joint.

2. All suspended piping shall have supports not more than 5' on centers for sizes under 2", and not more than 10' on centers for sizes 2" and larger.

3. All vertical risers shall be supported at each floor with vertical riser clamps and not more than 10’-0” intervals.

4. Supports at special conditions shall be as detailed on the plans.

C. All anchors in structural concrete shall be “Code-approved” anchors.

D. Supports to walls shall be made with "Molly" bolts.

E. Perforated strap hangers shall not be used for any work.

F. Insulation protection saddles, as specified hereinafter, shall be used at the following locations:

1. At pipe hangers on insulated hot and cold water lines, and condensate drain lines.
2. At trapeze hangers on any insulated piping.
3. At pipe rollers or other framed supports on any insulated piping.

G. Hangers for piping shall be adjustable split ring malleable iron similar and equal to "Fee & Mason" No. 199, or steel clevis type similar and equal to "Modern" No. 590, with threaded rod and turnbuckle in rod where hanging height permits. Except as otherwise specified, hangers shall be sized to fit the pipe.

1. Hangers shall be sized to fit the outside diameter of all insulated piping.

H. Trapeze hangers may be used for multiple parallel runs where specifically indicated on the plans, or elsewhere with permission of the Engineer.

I. All pipe openings shall be capped during construction. All steel pipe (except pre-insulated), before installation, shall be stood on end and pounded to remove dirt and scale, and all steel pipes shall be properly reamed before joints are made up.

J. All piping shall be installed so as to allow for expansion and contraction using offsets, expansion loops, swing joints, etc., as shown or as may be required to prevent undue strain on piping.

K. Pipe shall be cut accurately to fit. No bending or springing of pipe will be permitted.

L. All water piping shall be arranged for draining through fixtures, equipment, or to floor drains where necessary, by means of ¾" hose-end drain and ball valve.

M. Piping run on roofs shall be supported on corrosion-resistant pipe rollers with mounting curbs secured to the roof, as detailed on the Architectural Drawings.

N. All piping supports shall be connected to the top cord of joist or beam. Connection of supports to "X" bracing or cross support structural members is strictly prohibited.

3.08 PIPE JOINTS

A. Joints in sub-soil drainage piping shall be made up in accordance with the manufacturer's instructions, and/or as detailed on the drawings.

B. Except as otherwise noted, joints in threaded piping shall be made only with "Jointite" or equal, applied on the male thread only. The ends of pipes shall be square cut, reamed, and wiped clean before being made up into fittings.

C. Joints in general-purpose copper piping shall be "sweated", except as otherwise noted. Before making up joints, all copper shall be cleaned to bright metal with emery cloth, and treated with "No-Kerrode" or equal flux. Solder shall be lead-free type, composed of 95.5% tin, 4.0% copper, and 0.5% silver, similar and equal to "Silvabrite 100".

D. Joints in welded piping shall be made up with factory fabricated welding fittings as specified above which shall include all elbows, tees, laterals, reducers, etc., and shall be "Tube-Turn", "Taylor Forge", "Ladish", or "Crane" full radius type, except that tees may be formed for lines 4" and larger connecting to lines 6" and larger by saddling branch into side and main and connection of lines 1-1/2" and smaller into lines 2" and larger may be made with "Threadolets". All welding shall be done in accordance with standard practice utilizing only fully qualified welders, in accordance with Section IX of ASME Boiler and Pressure Vessel Code, and ANSI B31.1. All joints shall be smoothly fitted before welding, and welding rod shall be specifically suited to the pipe material. Flanges shall be weld-neck type, class to match valve, except #150 minimum.

E. Joints in PVC piping shall be U.L. listed solvent welded type with application and use of primer and solvent supplied and recommended by the manufacturer, and conforming to ASTM F-656 and F-493.

F. Joints in SDR heavy-wall PVC pipe shall be made up with vulcanized natural or synthetic rubber compression gaskets in factory-fabricated joint sections. Pipe and fitting ends shall be properly lubricated with an approved solution, and installed in strict accordance with manufacturer's instructions.

3.09 CLEANING, TESTING, AND ADJUSTING

A. It is the intent of this section of the specifications to provide for the thorough cleaning of the interior and exterior of all piping systems, and for all necessary tests during and at completion of the job to insure tight piping and correctly balanced systems. This Contractor shall do any and all work required to accomplish this end.

B. The various drainage and vent piping systems, and storm drainage systems throughout shall be tested upon completion of the rough work and with fixtures or traps connected. All openings, except at the tops of stacks shall be tightly closed by screw plugs or equivalent devices, and the systems shall be entirely filled with water, applied at minimum 10 feet of head, which shall stand without leak or loss of level for a period of four hours.

C. All indirect drainage piping shall be subjected to a 125 psig hydrostatic test and made tight at this pressure.

D. All potable hot and cold water piping, prior to being insulated, shall be tested in place to an air or hydrostatic pressure of 125 pounds per square inch at the first floor level for interior piping and the low point of the system for exterior piping, which pressure shall be maintained without pumping for a period of one hour.

E. All gas piping shall be first subjected to an air pressure test of 60 psi for a period of 30 minutes, and made tight at this pressure. Then all gas piping shall be given a final test by means of an air pump and a mercury gauge equal to the maintenance of a column of mercury 20" high for a period of twenty minutes, and made tight under said conditions, and the test repeated if any leaks are indicated. Pressure test of piping system shall include the meter loop.

F. Pressure gauges shall be installed to confirm each piping test.

G. All new strainers and filters shall be cleaned after pressure testing and system cleaning operations, and prior to final filling of systems.

H. All motors, bearings, etc., on all equipment shall be correctly oiled and/or greased with proper lubricant before the equipment is operated, and again at completion of the job.

I. The Contractor shall conduct operating tests of all equipment and other apparatus installed by him to demonstrate to the Owner and the Engineer the satisfactory operation of same and the fulfillment of the specified requirements. He shall make any additional tests that may be required by other authorities.

J. All waste lines and roof drains shall be inspected using color video equipment before substantial completion. Video of all lines will be provided with the close-out documents to the District indicating location of each line. Video shall also include photos of all underground and behind wall plumbing.

K. At the conclusion of satisfactory camera review, the Contractor will smoke test the wastewater system in the presence of the construction program supervisor and representatives from the District. Failed smoke test will be repeated after correction and repairs are made, again in the presence of the construction program supervisor and representatives from the District.

L. Contractor shall seal all floor penetrations to prevent vermin and insects from entering the building.

3.10 STERILIZATION OF POTABLE WATER LINES

A. Before being placed in service, all potable hot and cold water piping systems shall be sterilized with a chlorine cleaning solution and shall be completely flushed and rinsed out with cold water, as required by the Texas Department of Public Health.

B. Contractor shall provide and pay for a “Customer Service Inspection & Certificate” as required by the Texas Natural Resource Conservation Commission; Title 30 of the Texas Administrative Code; Section 290.46(j).

END OF SECTION

SECTION 22 2000

PLUMBING VALVES, STRAINERS & UNIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

1.02 SCOPE

This section of the specifications includes all labor and materials for the complete and finished installation of the following:

A. Valves, Cocks and Hydrants
B. Strainers
C. Unions
D. Valve Identification

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Piping
B. Insulation
C. Material Storage and Handling
D. Plumbing, Heating and Air Conditioning
E. Access Panels

1.04 SUBMITTALS

Submit manufacturer's certified rating data, descriptive literature, and catalogue cuts for all proposed:

A. Valves
B. Cocks
C. Hydrants
D. Strainers
E. Unions

PART 2 - PRODUCTS

2.01 VALVES, COCKS, STRAINERS AND UNIONS

A. All valves, cocks, strainers and unions shall have the name or trademark of the manufacturer and the guaranteed working pressure cast or stamped on the body, and all valves of any one type shall be of the same manufacture.

B. Unless otherwise specified or shown on the drawings, all valves shall be 125 psig, SWP, with sizes 2" and smaller screw or solder end, bronze body, and sizes 2-1/2" and larger flange end, iron body, or bronze trimmed.

C. Manufacturers' references given in the following table are to indicate a minimum standard of quality and design only.

		BRASS BODY	IRON BODY
1.	Ball Valves		
	Watts	B-6080-SS/B-6081-SS	
	Nibco	T/S 585-70-66	
	Apollo	77C-14X/-24X Series	
2.	Swing Check Valves, General Service		
	Crane	Fig. 37	Fig. 373
	Watts	B-5000/B-5001	Fig. F-511
	Nibco	Fig. T/S 413-B	Fig. F-918-B
	Apollo	163T	910F
3.	Gas or Air Valves*		
	Watts	B-6000-UL	
	Nibco	Fig. T-585-70UL	
	Apollo	77G-UL	
4.	Lubricated Plug Valves*		
	Homestead	Fig. 623	Fig. 602
	Nordstrom	Fig. 142	Fig. 115/165
	Milliken		Fig. 201M
5.	Balance Valves*		
	DeZurik	Fig. 103	Fig. 101 or Fig. 118
	Watts	Fig. CSM	Fig. CSM
	Milliken		Fig. 601E
	Nibco	Fig. T/S1710	Fig. 737

*A total of two (2) operating handles for each size and/or type required shall be furnished for this project.

D. Full port ball valves with stainless steel ball and stem shall be used in all potable water lines for general shut-off service.

E. Each interior gas appliance and equipment, including science tables, shall be provided with an AGA approved ball-type shutoff valve (lever handle) for gas piping 2” and smaller, similar and equal to "Apollo" 94A, installed upstream of union at no more than six (6) feet from equipment and appliance. All other equipment shutoff valves (water heaters, A/C units, etc.) shall be plug valves and lubricated plug valves as indicated and specified.

F. Strainers for Domestic Water Service:

1. Sizes 1/4" – 2": Shall be wye pattern, screwed ends, cast bronze body equipped with 20 mesh, Type 304 stainless steel screens, 40 mesh Type 304 stainless steel screens for gas or air service; similar and equal to "Watts" 777/777S Series or “Apollo” 59 Series.

2. 2-1/2" and Larger: Shall be wye pattern, flanged ends, ASTM A126 Class B cast iron body equipped with 1/16 perforation (2-1/2" – 5"), 1/8 perforation (6" – 8"), 3/16 perforation (10" – 12") double-coated, electrostatically applied, heat fused, FDA approved, epoxy coating on the interior and exterior; similar and equal to "Watts" 77F-D-FDA or “Apollo” 125Y Series. Each strainer 2" and larger shall be provided with a blow-off valve piped to a drain; 3/4" for up to 3" size; and 1-1/2" for 4" and larger.

G. Unions 2" and smaller shall be 300 psig, S.W.P., malleable iron screw end, with bronze seat ring, similar and equal to "Crane" Fig. 198E. Unions 2-1/2" through 4" shall be 300 psig, S.W.P., three-part flanged unions, with self-seating bronze to iron ball joint, similar and equal to "Walworth" 8301.

H. Dielectric Pipe Fittings and Unions: All water piping with connections to dissimilar metals shall be provided with dielectric fittings/unions designed to meet the requirements of ANSI B16.39. All pipe threads shall be in accordance with ANSI B2.1 and solder joints shall meet national plumbing standards. Dielectric fittings/unions shall be similar and equal to "Watts" 3000 Series.

1. Gray Iron: ASTM A48-83
2. Malleable Iron Parts: ASTM A197-79
3. Steel Parts: ASTM A108
4. Brass Parts: ASTM B16
5. Bronze Parts: ASTM B584
6. Zinc Parts: ASTM B633-85
7. Insulators: Watts #1425

2.02 HYDRANTS AND HOSE BIBBS

A. All exterior wall hydrants shall be 3/4" cast bronze frost proof box type, with galvanized wall sleeve, loose-key operators and threaded outlets, integral vacuum breaker, hinged latching cover plate, “Woodford” B65P. Finish shall be polished brass. Provide one (1) additional repair kit.

B. All exterior roof hydrants shall be similar in construction to wall hydrants specified, except constructed and arranged for roof mounting application; "Woodford" Y34 non-freeze roof hydrant with 34HD vacuum breaker, or equal, as detailed on the plans. . Provide one (1) additional repair kit.

C. All hose bibbs shall be 1/2" C.P. brass female flanged bibbs, with lockshield, loose-key handle, vacuum breaker and 3/4" hose end, similar and equal to "Chicago Faucet" No. 293 with E27.

D. Hose bibbs located in gang restrooms shall be recessed wall box type similar to “Josam” 71020.

E. Provide four (4) additional keys for each type hose bibb provided for the project.

2.03 VALVE IDENTIFICATION TAGS

A. Valve tags shall consist of a bronze or brass disc not under 1-1/2" diameter, stamped with the prefix "P", "AC" or “FP” followed by an identifying number not less than 1/2" high, "Seton" #250-BL, or equal.

PART 3 - INSTALLATION

3.01 VALVES, COCKS AND STRAINERS

A. Isolation ball valves (up to 2-1/2") or gate valves (3" and larger) shall be provided in all hot and cold water branch lines serving individual plumbing fixtures located remotely, groups of plumbing fixtures, and/or as indicated.

B. Valves, stop cocks, waste cocks, strainers, connections, etc., shall be provided wherever shown on the drawings, or required for controlling the various portions of the work, furnished by other trades or by the Owner, and including proper rough-in and final connection to such equipment. Isolation and controlling valves for every fixture and item of equipment shall be easily accessible from rooms or through access panels and not more than 1’-0” above ceilings or access panel.

C. Valves, cocks, strainers, etc., shall be installed in such a way as to facilitate operation and maintenance. When installed in horizontal lines, valve stems, shall be vertically upward. Joints shall be made up as specified for the corresponding piping. All isolation valves and disconnecting means shall be located in such a manner that the isolated device (coil, tube bundle, etc.) can be physically removed and replaced without shutdown or interruption of the piping system to which connected.

D. All valves shall be provided with stem extensions through pipe insulation as required for free movement of lever and wheel handles. Stem extensions shall also be provided for below-grade valves in valve boxes, as required for lever and wheel handle elevations at no more than 4" below cover plate.

E. Each strainer shall be provided with a blow-off valve.

F. Each valve installed for balancing purposes shall have adjustable memory stops.

G. Isolation valves shall be located at a maximum of 2’-0” above ceilings.

H. Isolation valves not located above ceilings, exposed in mechanical spaces, equipment isolation, controls valves, etc. shall be located at maximum of 6’-0”.

3.02 UNIONS

A. No unions are to be placed in a location that will be inaccessible after completion of the building unless specifically shown on plans or specified otherwise.

B. Unions shall be installed on each side of all special valves, regulators, etc., and one side of all check valves, thermostatic traps and at all pieces of equipment such as pumps, cooling and heating units, coils, tanks, etc., so that such equipment may be readily disconnected.

C. Where joints are made up with bolted flanges or grooved mechanical couplings, separate union fittings as such will not be required.

3.03 WALL HYDRANTS AND HOSE BIBBS

A. All wall hydrants shall be placed 18" above the finished outside grade or floor.

B. Except as otherwise indicated, all hose bibbs shall be installed 20" above finished floor line.

C. Location of hose bibbs in gang restrooms shall be approved by the Architect.

3.04 VALVE IDENTIFICATION

A. The Contractor shall attach to the handle of each valve installed an identifying valve tag. Attachment of tag shall be by means of brass jack chain or brass "S" hook as appropriate for valve size.

B. Valve tags may be omitted when the function of the valve is completely obvious, of secondary importance, and immediately adjacent to and in plain sight of the equipment served, such as lavatory supply stops, isolation valves at water coils, etc. Every valve used for flow-control balancing, for system isolation, or in any other manner not completely self-explanatory, must be tagged.

C. The number, location and purpose corresponding to each valve shall be listed in sequence, properly typewritten on a schedule sheet and submitted to the Engineer for approval. The approved schedule shall be framed under glass and mounted on the wall where directed.

D. All valve tag identification shall be indicated on the as-built drawings and a copy of the typewritten schedule shall be included in the operation and maintenance manual.

END OF SECTION

SECTION 22 3000

PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

1.02 SCOPE

This section of the specifications includes all labor and material required for the complete, coordinated, and finished installation of the following systems:

A. Hot water generation and distribution

1.03 SPECIFIC WORK CATEGORIES SPECIFIED ELSEWHERE

A. Piping
B. Valves, strainers & unions
C. Insulation
D. Plumbing fixtures
E. Traps and drains

1.04 SUBMITTALS

Submit manufacturer's certified rating data, descriptive literature, and catalogue cuts for the following proposed items:

A. Water heaters
B. Hot water circulators
C. Plumbing specialties
D. Backflow preventers
E. Gas pressure regulators
F. Grease trap
G. Water hammer arrestors
H. Hot water blending valves
I. Trap seal primers
J. Flues
K. Submersible sump pump

PART 2 - PRODUCTS

2.01 WATER HEATER, GAS-FIRED CONDENSING TYPE

A. Water heater shall be high-efficiency type (95% efficiency), complete with adjustable thermostats, high temperature shut-off, manual gas valve and pilot valve, diaphragm gas valve with positive shut-off, gas pressure regulator, cast iron manifold or stainless steel type burner, seamless glass-lined steel tank, maintenance-free powered anode, hot and cold water connections, ASME relief valve per local code, integrated solid-state electronic control, listed and certified, low water cutoff, ignition control, integral diagnostics & user interface, low NO_x certified, and rated for 160 psig minimum working pressure; concentric vent kit and condensate neutralization tube. Each water heater having an input rating of 200,000 BTUH or greater shall also include an ASME stamped tank.

B. Contractor shall coordinate and provide power that may be required for any accessories such as flue power vents, etc.

C. Water heater shall be “Lochinvar” “Shield”, or equal with owner approval.

D. Capacity shall be as scheduled on the plans, and entire unit shall be U.L. labeled or approved equal.

E. Contractor shall provide a full three (3) year tank warranty.

F. Provide factory authorized start-up with maintenance staff member on site during start up.

G. Contractor shall provide manufacturer data showing water heater(s) meet efficiency ratings per 2009 IECC, Section 504; Table 504.2.

2.02 WATER HEATERS, ELECTRIC

A. Electric water heaters shall each be commercial tank type as indicated, with insulated and lined steel tank rated for 125 psi minimum working pressure, Inkaloy-sheathed immersion type electric heating element, adjustable thermostat, and high temperature shutoff; as manufactured by "A.O. Smith", or approved equal.

B. Capacity shall be as scheduled on the plans, and entire unit shall be U.L. labeled or approved equal.

C. Water heater shall be “Lochinvar”, or equal with Owner’s approval.

D. Provide factory authorized start-up.

2.03 WATER HEATER, UNDERCOUNTER ELECTRIC

A. Undercounter electric water heaters shall be wall-mounted with coated tank, anode rod, plug-in cord, combined adjustable thermostatic control, back-lit “ON-OFF” switch, all contained within a non-rusting molded plastic housing. Insulation shall be injected foam. Water heater shall have a two (2) year limited warranty, U.L. listed and provided with a ¾” relief valve opening; “Ariston” GL Series, or approved equal.

B. Capacity shall be as scheduled on the plans, and entire unit shall be U.L. labeled or approved equal.

2.04 HOT WATER CIRCULATOR

A. Hot water circulator shall be a line-mounted, close-coupled, centrifugal pump, "Bell & Gossett", "Taco", "Thrush", "Armstrong", or equal. Pump shall have hardened, ground, and polished steel or stainless steel shaft, with integral thrust collar; bronze impeller; mechanical seal; bronze body and trim, and shall be driven through a flexible coupling by an electric motor.

B. Hot water circulator shall be provided with a manual "on-off" switch, "G.E." #CR1061, or equal. See Automatic Control Specifications for additional pump control information.

C. Isolation valves shall be provided on each side of circulating pump.

D. Capacity shall be as indicated on the plans.

2.05 PLUMBING SPECIALTIES

A. Each water heater shall include a combination temperature and pressure relief valve sized for not less than the full BTUH input of the water heater. Product must conform to the latest test standard of ANSI Z21.22 with ratings as certified and listed by CSA.

B. Contractor shall provide and install potable water thermal expansion tank(s) on the cold water supply line serving each water heater with a capacity of 20 U.S. gallons or larger. Unit shall be pre-charged, equipped with a fixed FDA approved butyl bladder and a charging valve connection to facilitate on-site charging of the tank to meet system requirements.

1. For water heaters of non-ASME construction, potable water thermal expansion tanks registered with a credible listed agency (i.e., IAPMO) are allowed; "Watts" Series PLT.

2. For water heaters stamped and constructed in accordance to ASME; the installation of a potable water thermal expansion tank constructed in accordance with Section VIII of the ASME Boiler and Pressure Code is required, and shall be stamped with a maximum allowable working pressure equal to or greater than the water heater (unless authorized otherwise by the Texas Department of Licensing and Regulation, Code Review and Inspections, Boiler Program); "Watts" Series DETA.

2.06 BACKFLOW PREVENTERS

A. Full line-size backflow preventer assemblies shall be provided to protect the domestic water system. Each backflow preventer shall be double-check type or reduced pressure (RPZ) type as indicated on the drawings and as otherwise required by the local code authorities and city water department. Each assembly shall include strainer and entering and leaving isolation valves (ball type for sizes up to 2-1/2", and gate type for 2-1/2" and larger).

B. Backflow preventers shall be "Watts" Series 709 or 775 for double-check type, and "Watts" Series 909 or 975 for reduced pressure type. Discharge shall be to the outside of the building.

C. Each “RPZ” type backflow preventer shall be provided with a “Watts” Model ACV-113-6RFP flood protection shut-down valve, complete with solenoid control valve, flow sensor, time delay junction box, and limit switch.

2.07 GAS PRESSURE REGULATORS

A. Gas pressure regulators shall be provided for each equipment item served and for low-pressure branches off of medium pressure mains as indicated on the plans. Each regulator shall be rated for a minimum working pressure of 125 psig, and selected to regulate not less than the indicated quantities from 5 psig to 6 oz/sq.in. (adjustable) – or individual nameplate quantities as ounce-to-ounce regulators. Regulator shall include die-cast aluminum diaphragm casing with weather-treated aluminum finish, high strength diaphragm, permanently lubricated aluminum valve, cast iron valve body, stainless steel levers, vent valve, cast-in stamping, etc. for a complete assembly; "Fisher" Series S200, or equal.

2.08 WATER HAMMER ARRESTERS

A. Contractor shall provide and install a properly sized (per PDI) water hammer arrester at each domestic hot/tempered and cold water riser or branch serving each stack of toilets, at each set of water lines serving more than one (1) water closet, and each branch serving clothes wash(s). Water hammer arresters shall be “Hydra-Rester” as manufactured by “Sioux Chief Mfg. Co.”, or equal.

2.09 FLUES

A. Water heater flues shall be Schedule 40 PVC per manufacturer’s instructions.

2.10 HOT WATER BLENDING VALVE

A. Master mixing valve shall feature paraffin-based, thermal actuation technology for precise temperature control. Valve shall be listed to ASSE 1017 and certified to CSA B125 and have an approach temperature of 5^{o}F (3^{o}C). Valve shall have an outlet temperature range from 90^{o} – 160^{o}F (32^{o} – 71^{o}C) with a lockable temperature-setting feature. Valve shall be manufactured of corrosion-resistant materials and feature a single-seat design for positive shutoff. Valves shall come standard with union check stops and minimum flows to ASSE 1017. Valve shall be similar and equal to “Leonard” ”LV” Series or Equal.

2.11 AUTOMATIC TRAP SEAL PRIMER

A. Trap seal primer shall be “Precision Plumbing Products” Model P1-500, all-bronze valve with gasketed access cover and integral vacuum breaker. Contractor shall connect trap primer to nearest active domestic cold water line with isolation valve. Trap primers shall be installed above an accessible ceiling or behind a lockable access panel with location approved by the Architect.

2.12 GREASE TRAP

A. Grease trap shall be field-built as detailed on the drawings, or may be pre-cast reinforced 4500-psi concrete type, with cast-in-place connections and 20” diameter cast iron rings and covers, as manufactured by “Hanson”. Size shall be as noted on the plans and approved by the City of Arlington, Texas.

2.13 SAND & OIL INTERCEPTOR

A. Sand and oil interceptor shall be pre-cast reinforced 4500-psi concrete type, with cast-in-place connections and 24" diameter cast iron rings and covers, as manufactured by "Hanson". Size shall be as noted on the plans and approved by the City of Arlington, Texas.

2.14 SUBMERSIBLE SUMP PUMP WITH OIL DETECTION

A. Submersible sump pump shall have oil-filled overload-protected motor, heavy cast iron construction, elevated suction inlet with molded inlet screen, U.L. listed, and automatic switch level control and oil detection and alarm; "Liberty Pump" Model ELV290, or equal.

2.15 ICE MAKER VALVE BOX

A. Contractor shall terminate all standard refrigerator ice maker connections in galvanized ice maker valve box; "Guy Gray" Model BIM875, or equal.

PART 3 - INSTALLATION

3.01 WORKMANSHIP

A. All workmanship shall, in all respects, be of the highest grade, and all construction shall be done according to the best practice of the trade. Work shall be done by mechanics experienced and skilled in the trade. All work shall be in strict accordance with manufacturer's recommendations, and completed to the entire satisfaction of the Architect.

3.02 EQUIPMENT ITEMS

A. All equipment items and specialties shall be installed in accordance with the details on the plans, and in strict accordance with the manufacturer's instructions.

3.03 BACKFLOW PREVENTERS

A. Backflow preventers shall be installed at connections to closed mechanical water makeup systems, and/or as indicated on the drawings and otherwise required by local code authorities and city water department for water supply services.

B. Drain outlet connections at backflow preventers shall be piped to nearest floor drain.

C. The Contractor shall verify with local authorities the type, quantity and locations of backflow preventers required.

D. Anti-flood valve discharge line shall be piped to outside the building.

3.04 GAS PRESSURE REGULATORS

A. Gas pressure regulators shall be sized to meet design flow rates and pressures indicated, and shall be installed in accordance with the manufacturer's recommendations.

B. Discharge of each regulator shall be located and/or piped to a minimum of 10'-0" from any air intake in accordance with Mechanical Codes.

3.05 HOT WATER BLENDING VALVES

A. Contractor shall provide one (1) spare repair kit for each mixing valve provided on the project.

B. Master mixing valve shall be installed and piped per manufacturer's recommendations.

C. Contractor shall come back at three (3) and six (6) months after the system is operational to verify that the system is properly balanced.

3.06 FLUES

A. Flues shall be run from the appliance connections through the roof as shown, and terminated with an approved flue cap and self-flashing base. Installation methods shall be as recommended by the manufacturer, and per applicable requirements of NFPA 54.

3.07 COMBUSTION AIR

A. Contractor shall provide combustion air as shown on the plans or as directed. Combustion air shall be installed in accordance with all applicable codes.

3.08 WATER HEATERS

A. All floor-mounted water heaters shall be mounted on a 4" concrete pad.

B. Provide overflow drain pans for all suspended water heaters with drain connection (nipple) and full size drain line.

C. Hot water piping at each non-recirculating water heater shall include a "heat trap" in the cold water and hot water supply lines as detailed, and in accordance with the International Energy Conservation Code.

D. Bottom feed water heaters shall be provided with vacuum breaker.

END OF SECTION

SECTION 22 4000

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

1.02 SCOPE

A. This section of the specifications includes all labor and material required for the complete and finished installation of all plumbing fixtures.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Plumbing equipment and accessories
B. Piping
C. Valves, strainers & unions
D. Sleeves
E. Escutcheons
F. Excavation and backfilling
G. Material storage and handling

1.04 SUBMITTALS

Submit manufacturer's certified descriptive literature, catalogue cuts, and/or certified rating data for all proposed:

A. Plumbing fixtures
B. Trim for plumbing fixtures

PART 2 - PRODUCTS

2.01 GENERALLY

A. All fixtures shall be new and best of their respective kinds. They shall be non-absorbent throughout, and free from waves, kiln marks, or discoloration.

B. All surfaces coming in contact with surfaces of other fixtures shall be factory ground truly flat, and shall be bedded with fine dental plaster.

C. All supplies shall be braided stainless steel hose with quarter-turn stops and escutcheons. All exposed finish metal parts shall be chromium-plated; rough-bodied parts shall be heavily nickel-plated. All enameled ironware shall be acid resisting. Escutcheons for lavatory and sink supplies and waste arms shall be chrome plated, cast brass, set-screw-held type as previously described in Section 21 0000 of the specifications. "Cone washers" in any form are expressly prohibited.

D. Traps for lavatories and sinks shall be three-piece chromium-plated cast brass with cleanouts, I.P.S. tailpiece, and chromium-plated nipple to wall.

E. All trim shall be first line quality, and shall be clearly marked for corroborative identification. Trim, unless otherwise noted, shall be manufactured by the same manufacturer as the respective fixture; or if manufactured by others, shall be trim regularly furnished with the fixture and fully guaranteed by the fixture manufacturer.

F. All fixtures shall be operable with a force no greater than 5 lbs.

G. Each Contractor shall examine both the Mechanical and Architectural Drawings and coordinate the exact location of all plumbing fixtures and provide all necessary fixtures, outlets and/or service required. Exceptions and inconsistencies in the drawings shall be brought to the attention of the Architect before entering his bid. Submission of a bid will be taken as evidence that examination of the drawings has been made and the cost of all services are provided.

H. All plumbing fixtures shall be “TAS” compliant.

I. Offset toilet flanges are expressly prohibited and shall not be used.

J. All fixtures shall be EPA certified as lead-free.

K. All supply stop connections at wall shall be threaded or sweated connections. Compression connections are not acceptable.

2.02 PLUMBING FIXTURES

A. Plumbing fixture types as specified represent minimum standard of quality required for this project. Equivalent styles and types of plumbing fixtures furnished by the following manufacturers will be acceptable:

1. Urinals, Water Closets, Lavatories and Carriers: “Sloan”, "Kohler", "American Standard", “Watts”
2. Sinks: "Elkay", "Just"
3. Electric Water Coolers: “Halsey Taylor”/”Elkay”, "Murdock”
4. Mop Sinks: “Acorn”, "Fiat", "Williams"
5. Washfountains: "Sloan”
6. Valves, Faucets and Trim: "Delta", “T&S Brass”
7. Flush Valves: “Sloan” Regal
8. Showers: “Acorn”

B. The following "American Standard" catalogue numbers or approved equal fixtures by "Kohler", "Crane", or other acceptable manufacturers shall be the basis of the bid:

Fixture Type "A-1" (Water Closet; Wall-Hung): "Sloan" ST-2459, wall-hung white vitreous china with 1-1/2" top spud; bolt caps; "Sloan" "Regal" #111 low consumption (1.28 G.P.F.) flush valve set at maximum 30" above floor; "Olsonite" No. 95 CC open front white seat with check hinges; "JR Smith" Series 0200 adjustable carrier with 4" outlet; anchor foot; and arranged to fit the plumbing layout indicated on the plans. See Architectural Drawings for mounting heights.

Fixture Type "B-1" (Lavatory; Wall-Hung; Hot and Cold Water): "Sloan" SS-3003 white vitreous china, 18 ¼ x 20 ¾ wall-hung lavatory with 4"centerset, backsplash and front overflow; with "T&S" No. B0890-VF05, 4" lavatory fittings and 0.5 GPM spray device; drain with McGuire 155A and 1-1/4" tailpiece; "McGuire" LFBV2165SS12 or 16 – quarter-turn lav supply kit. ½" IPS x 3/8" OD12" or 16" stainless braided risers, 8872 P-trap; "JR Smith" Type 0700 concealed arm carrier. See Architectural Drawings and Specifications for mounting height.

Fixture Type "B-2" (2-Person Washstation): "Sloan" Model "EW 7200" 2-person wash station fountain sink with solid surface bowl, pedestal and top cover (color as selected by Architect) heavy gauge stainless steel front access panel; P-trap, supplies and integrated automated faucets and below deck mixing valve.

Fixture Type "C-1" (Urinal): "Sloan" SU-1009, vitreous china wall-hung siphon jet urinal, 1.0 GPF, with integral flushing rim, flow control, extended shields, integral strainer and trap, cleanout, 3/4" top spud, 2" I.P.S. outlet connections; "Sloan" "Regal" #186.1 flush valve; "JR Smith" Type 0636 chair carrier. See Architectural Drawings and Specifications for mounting height.

Fixture Type "D-1" (Corner Mop Basin): "Acorn" Model TNC-32, 32" x 32" x 12" pre-cast terrazzo corner mop basin with 6" drop front integrally cast stainless steel threshold; 3" I.P.S. drain outlet for caulked lead to 3" P-trap, removable stainless steel grid strainer; "T&S" No. B-0665-BSTR service sink faucet centered over drain with vacuum breaker, integral stops, adjustable wall brace, pail hook, ¾" hose thread spout, 8" centers, wall-to-spout outlet, "T&S" No. B-0654; stainless steel hose bracket with spring loaded rubber grip. 30" rubber hose with plain end outlet and ¾" garden hose female inlet. "T&S" No. B-0653 17 11/16" long stainless steel mop hanger with (3) spring loaded rubber grips. Set faucet at maximum 36" above floor.

Fixture Type "E-1" (Sink; Single Compartment; Barrier-Free): "Elkay" LRADQ-2219-55, 22" x 19-1/2" x 5-1/2" deep bowl, single compartment, ledge back, 18 gauge Type 302 stainless steel sink with satin finish, integral mounting rim, and sound dampening applied to underside; LK-99 stainless steel waste outlet with strainer, stopper, and 1-1/2" tailpiece; "T&S Brass" Model B-1148 – 8" deck mount faucet, 8" high-arc swivel/rigid gooseneck; "McGuire" LFBV2165SS12 or 16 – quarter-turn lav supply kit. ½" IPS x 3/8" OD12" or 16" stainless braided risers, and "McGuire" 8872 P-trap.

Fixture Type "E-2" (Nurse Sink): "Elkay" LRADQ-2219-55, 22" x 19-1/2" x 5-1/2" deep bowl, single compartment, ledge back, 18 gauge Type 302 stainless steel sink with satin finish, integral mounting rim, and sound dampening applied to underside; "T&S Brass" Model B-1148 – 8" deck mount faucet, 8" high-arc swivel/rigid gooseneck; "McGuire" LFBV2165SS12 or 16 – quarter-turn lav supply kit. ½" IPS x 3/8" OD12" or 16" stainless braided risers, and "McGuire" 8872 P-trap.

Fixture Type “E-3” (Sink; Single Compartment; Barrier-Free with Plaster Trap): “Elkay” LRADQ-2219-55, 22” x 19” x 5-1/2” deep bowl, single compartment, ledge back, 18 gauge Type 302 stainless steel sink with satin finish, integral mounting rim, and sound dampening applied to underside; 151A stainless steel waste outlet with strainer, stopper, and 1-1/2” tailpiece; “T&S Brass” Model B-1148 – 8” deck mount faucet, 8” high-arc swivel/rigid gooseneck; “McGuire” LFBV2165SS12 or 16 – quarter-turn lav supply kit. ½” IPS x 3/8” OD12” or 16” stainless braided risers; 8872 P-trap. Provide undercounter plaster trap “JR Smith” top access; Series 8710-T-02 or equal.

Fixture Type “E-4” (Wash Sink): “Elkay” 14-1C22x22-OX, 16 gauge Type 304 stainless steel sink with 1-3/4” radius vertical and horizontal cover corner, 1-1/2” rolled rims, full length backsplash, satin finish with wall hanger, stainless steel support brackets and sound dampening applied to underside; “T&S” No. B-0230-135X-WH4 through-back sink fitting and 4” wrist handles; 152 stainless steel grid drain fitting with 1-1/2” O.D. tailpiece; “McGuire” LVBV2165SS12 or 16 quarter-turn lav supply kit. ½” IPS thread x 3/8” OD, 8872 P-trap.

Fixture Type "F-1" (Electric Water Cooler; Barrier-Free): "Elkay" EZS-8 wall-mounted cooler with hermetically sealed air cooled condensing unit; 7 G.P.H. cooling capacity, 80°F to 50°F at 90°F ambient temperature; tinned copper tank, tinned C.P. brass self-closing stop, adjustable thermostat, stainless steel top, and welded heavy-duty steel frame, front and side controls; "Elkay" Model LKEZAPR handicap apron. See Architectural Drawings and Specifications for mounting height.

Fixture Type "F-2" (Electric Water Cooler with Bottle Filling Station; Barrier-Free): "Elkay" LZ58WSLK wall-mounted cooler with bottle filling station with filter and hermetically sealed air cooled condensing unit; 7 G.P.H. cooling capacity, 80°F to 50°F at 90°F ambient temperature; tinned copper tank, tinned C.P. brass self-closing stop, adjustable thermostat, stainless steel top, and welded heavy-duty steel frame, front and side controls; "Elkay" Model LKEZAPR handicap apron. See Architectural Drawings and Specifications for mounting height.

Fixture Type "G-1" (Barrier-Free Shower): "Acorn” Shower-Ware 500ADA Series No. 538ADA-R/L-LVR-BA-MSH-HL; 538 T/P Temperature-Pressure Balancing Mixing Valve with Patented Ligature Resistant ADA Tri-Lever Handle (ASSE 1016 Compliant): Right or Left Orientation (R/L); Lever Handle and Diverter Valve (-LVR); Bent Arm with Wall Flange (-BA); Mult-Stream Ball Joint Shower Nozzle narrow to wide pattern for sue with Bent Arm (-MSH); Hi-Lo mounting bracket for hand shower (-HL). See Architectural Drawings and Specifications for mounting height, grab bars, seat, and control/shower head locations.

2.03 SEALANT

A. "GE Silicone", Sanitary 1700 Sealant. Color to match plumbing fixture.

PART 3 – INSTALLATION

3.01 GENERALLY

A. Fixture installation shall be as indicated on the plans and in strict conformance with the manufacturer's recommendations.

B. The Contractor shall provide proper support for fixtures and piping. Wall-hung fixtures not provided with chair carriers shall be hung with 2" x 4" oak backup piece inside chase, with bolts extending through wall to fixture hangers.

C. Wall-hung lavatories that are not specified to be supported by concealed arm hangers, shall be secured from the bottom in addition to standard hangers, either by toggle bolts through the wall and perpendicular to the wall, or by brackets secured to the wall under the lavatories. Mounting heights shall be as indicated on the plans or specified herein.

D. All fixtures shall be protected with not less than two thicknesses of tough building paper, pasted on, and fully covering all surfaces, using paste as recommended by the fixture manufacturer. Job must be turned over to the Architect with all fixtures clean and free from damage.

E. Exposed P-traps and/or water supplies at all wall-hung lavatories/sinks shall be covered with insulation wrap; "Brocar" Trap Wrap, or equal.

F. Provide 12” minimum below the flush valve tail and the fixture.

END OF SECTION

SECTION 23 0400
ARCHITECTURAL REQUIREMENTS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Size, Weight, Fall Protection and Screening Requirements for HVAC Unit Field Modifications

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

B. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

C. Division 23 - Heating, Ventilating and Air Conditioning

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of all HVAC equipment with size, weight, fall protection and screening requirements for HVAC Units.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

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

B. Provide engineered drawings stating compliance with this specification section.

C. Provide sightline study to verify compliance with this specification section.

1.05 QUALITY ASSURANCE

A. Work covered by this section of the specifications shall conform to the contract documents, as well as state and local codes.

B. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Texas.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

E. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 ARCHITECTURAL REQUIREMENTS

A. The purpose of these specifications is to define the performance and design standards for modifications of HVAC equipment required for products not listed as "Basis of Design" or relocated due to other coordination parameters.

B. Coordinate the installation of all HVAC equipment with size, weight, fall protection and screening requirements for HVAC Units and make adustments as required to comply with state and local codes and ordinances.

C. Screening:
   1. Contractor shall verify that the unit heights and placement for the provided equipment and curbs do not exceed those detailed in the construction documents.

2. If the total height and placement differs from the locations or details of the construction documents, the Contractor shall perform a sightline study to verify compliance with the local screening codes and ordinances and make the required modifications to comply. Contractor shall verify compliance before any parapet walls are constructed or screening equipment is ordered.

D. Size:
   1. Contractor shall verify the size of all units, roof curbs and structural openings for equipment that deviate from the units or openings as detailed in the construction documents and make the required adjustments.

E. Weight:
   1. Contractor shall confirm the weights of the provided equipment and verify compliance with the designed loads shown on the construction documents. If the weights exceed those designed, Contractor shall coordinate with the General Contractor and Structural Detailer to adjust the joist or steel design as required.

F. Fall Protection:
   1. Contractor shall provide fall protection for any unit locations that are modified in the field, where the modifications locate them adjacent to any hazzards that require fall protection by state or local codes.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 23 0700

HVAC INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

1.02 SCOPE

A. It is the intent of this specification that all piping, ductwork, mechanical equipment, and/or associated appurtenances connected thereto shall (except for obvious functional reasons or where otherwise specifically excepted herein) be insulated whenever the exterior surfaces are or can be:

1. Above 125°F
2. Below average ambient dew point

1.03 QUALITY ASSURANCE

A. The Contractor shall cover all piping and apparatus as specified hereinafter or otherwise required with insulation as manufactured by “Knauf Insulation”, “Manson Insulation”, "Johns Manville", "Armacell", "Owens Corning", or equal.

1.04 WORK SPECIFIED ELSEWHERE

A. Factory-applied insulation of equipment

1.05 SUBMITTALS

Submit manufacturer's certified rating data and descriptive literature for all proposed:

A. Pipe insulation
B. Duct insulation
C. Mastic and sealants

1.06 INSULATION NOT REQUIRED

No field-applied insulation will be required for the following:

A. Supply, return and outside air ductwork indicated on the plans as pre-insulated double-wall type with 1-1/2" or 2" thick interior acoustic lining, except as necessary to meet the minimum R Value requirements of local city code, and/or as scheduled herein (most stringent requirement):

	DUCT LOCATION	Insulation Minimum R Value
1.	Conditioned air supply duct and return duct systems exposed to weather, in uninsulated or ventilated attic spaces, and ventilated crawl spaces.	8
2.	Conditioned air supply duct and return duct systems located in mechanical equipment rooms, furnace enclosures, shaft enclosures, or such other spaces connecting with unconditioned ambient air.	6
3.	Conditioned air supply and return duct systems in unventilated roof/ceiling, unventilated and uninsulated attics, floor/ceiling spaces and interior walls, and exposed within interior unconditioned spaces.	5
4.	Conditioned air supply duct systems located in concealed or exposed conditioned spaces.	4
5.	Return air duct systems in conditioned spaces	None Required

B. All exhaust ductwork, except as otherwise noted.

C. Flexible pre-insulated ductwork.

D. A/C units (will be furnished with factory-applied insulation).

E. Condensate drain piping exposed outside the building, except as otherwise noted.

F. EXCEPTION: Any installed surface within the building, insulated or not, found to be above 125°F or found to be condensing moisture when in normal operation during average ambient humidity conditions, shall receive supplemental insulation sufficient to eliminate the problem, as directed.

PART 2 - PRODUCTS

2.01 PIPE INSULATION

A. Rigid urethane insulation may not be used in lieu of glass fiber.

B. A/C unit condensate drain lines shall be insulated with 1" "Armacell Armaflex" or equal flexible foamed plastic tubing except condensate drain lines run within HVAC supply/return plenums shall be insulated with 1" thick fiberglass as previously described for potable water under Section 22 0700 Plumbing Insulation.

2.02 DUCT INSULATION

A. All interior exposed supply, return and outside air ductwork, including that in the mechanical rooms shall be insulated with minimum 1-1/2" thick, rigid glass fiberboard (3 P.C.F. min. density), with a factory-applied "ASJ" vinyl-coated embossed foil vapor-barrier laminate jacket. Insulation for exterior ductwork exposed to the weather shall be increased to 3" thickness, and shall include aluminum jacket as specified under installation.

B. All interior concealed supply, return, and outside air ductwork, and top surfaces of ceiling diffusers, shall be insulated with minimum 2" thick flexible fiberglass (3/4 P.C.F. min. density), with factory-applied FRK-25 reinforced aluminum foil-faced vapor-barrier.

C. All slot diffuser and register supply plenum boxes shall be insulated with minimum 2" thick flexible fiberglass (3/4 P.C.F. min. density), with factory-applied FRK-25 reinforced aluminum foil-faced vapor-barrier. Insulation shall fully enclose supply plenum box and slot diffuser connection.

D. No internal acoustical lining insulation shall be provided in lieu of external insulation specified, unless noted and shown to be provided on the drawings.

E. All duct insulation shall meet minimum "R" values specified under Paragraph 1.06 A. Specified thickness shall be increased if required to meet "R" values. Duct insulation will not be required for all internally insulated double-wall ductwork, except as required to meet "R" value requirements as specified above, at thickness required to meet specified "R" values.

F. Insulation shall have a minimum thermal conductivity (K-Value) of 0.24 per inch at 75^{o}F.

G. All kitchen hood exhaust ductwork shall be insulated with 1-1/2" thick high-temperature flexible wool blanket, with factory reinforced aluminum foil-faced vapor barrier. Insulation shall be U.L. classified for 2-hour fire rating in accordance with NFPA 96, shall have smoke developed and flame spread rating of 0, and minimum temperature rating of 1800^{o}F. Insulation shall be "Johns Manville" Firetemp Wrap, or equal.

2.03 FIRE AND SMOKE RATINGS

All insulation and insulation jackets (except foamed plastic and PVC covers) shall have UL Pipe and Equipment Covering rating RSS83 U8.15, not to exceed:

A.	Flame Spread	25
B.	Fuel Contributed	50
C.	Smoke Developed	50

PART 3 - INSTALLATION

3.01 PIPE INSULATION

A. Glass Fiber Insulation: The sections shall be applied to dry pipe and secured with the self-sealing butt and longitudinal lap of the jacket. Fittings, valves, etc., shall be wrapped with glass fiber material to an equivalent thickness and density to the pipe insulation, and finished with PVC covers installed as directed by the manufacturer.

B. Foamed Plastic Insulation: On pipe or tubing not yet installed, unslit flexible tubing shall be slipped over the full length of the piping or tubing leaving a sufficient amount of exposed piping for connections. After connections are made and tested, insulation shall be applied over fittings so as to cover all piping completely. Slit insulation shall be used on systems that are to be insulated after installation. All butt joints and slit insulation shall be sealed with "Armstrong" 520 adhesive. Insulation exposed to the weather shall be finished with two (2) coats of "Armstrong" Weather-Proof Plastic or equal, reinforced with a layer of glass mesh embedded in the first coat while wet.

C. Protective metal 180° shields of galvanized steel, in sizes and gauges as listed below, shall be installed on the lower half of all insulated lines, at each support point, and secured with two (2) copper or aluminum wires or bands.

PIPE SIZE	GAUGE OF METAL	LENGTH OF SHIELD
1/2" - 2-1/2"	18	6"
3" - 5"	16	10"
6" - 8"	16	14"
10" - Up	16	18"

3.02 DUCT INSULATION

A. Rigid insulation shall be impaled over perforated metal base spindle anchors, which are to be installed with “Miracle Adhesive” #994, or equal. The insulation shall be secured with self-locking washers. All washers and joints or breaks in the facing shall be sealed with a heavy coat of “Benjamin Foster” #30-35, or equal, mastic.

B. Blanket insulation shall be applied in sections long enough to wrap around duct and meet securely without stretching and secured with "Bostich" outward clinching staples on 3" centers. On ducts over 24" wide spindle anchors on 24" centers shall be used to eliminate sagging of the insulation. All joints and seams of the insulation shall be sealed with a heavy coat of "Benjamin Foster" #30-35 or equal mastic or with an approved foil-scrim tape as recommended by the insulation manufacturer.

C. All joints and seams for kitchen hood exhaust insulation shall be sealed with U.L. classified fire resistant sealant in accordance with manufacturer’s recommendations.

3.03 INSTALLATION, GENERALLY

A. All sectional covering shall finish round and smooth without lumps or depressions, and all ends and joints shall butt evenly and tightly together and to the covered surface. No damaged or broken sections shall be used. Blocking shall be provided at pipe supports in all pipe insulation exposed in occupied spaces, as required to eliminate crimps or depressions. When covering is formed from blocks, they shall be carefully and evenly applied, securely wired in place, and joints shall be closed with cement insulation.

B. All insulated lines or ducts passing through walls or floors shall be provided with metal sleeves large enough to pass a full thickness of insulation.

C. After being painted as specified elsewhere, any insulation showing signs of coming loose or tendencies of the cloth pulling shall be removed and reapplied.

D. The application of all insulation shall be made strictly in accordance with the manufacturer's directions and by experienced craftsmen in a neat, careful, and workmanlike manner. All unsightly or sloppy work will be rejected.

E. Vapor-barrier and finish shall be continuous at all supports.

F. All exposed surfaces of insulated piping and ductwork exposed to the weather shall be finished out with a .016 mil. aluminum jacket secured with ½" bands and clips on 12" centers, sealed as required.

END OF SECTION

SECTION 23 3000

HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

1.02 SCOPE

This section of the specifications includes all labor and materials required for the complete and finished installation of the following:

A. Ductwork
B. Air distribution devices
C. Fans
D. Flexible connections

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Unitary HVAC units
B. Air filters
C. Insulation
D. Vibration isolation
E. Access doors
F. Piping

1.04 SUBMITTALS

A. Submit manufacturers certified rating data, descriptive literature, and catalogue cuts for all proposed equipment items as follows:
   1. Fans
   2. Air distribution devices
   3. VAV terminals
   4. Fire dampers and fire/smoke dampers
   5. Flexible ductwork
   6. Duct construction standards
   7. Shop drawings of duct layout

B. Submittals for roof-mounted equipment shall include detailed construction literature for units and roof curbs, including wind load resistance ratings in accordance with the specifications and meeting the wind load requirements in the International Building Code. Wind resistance ratings shall be supported by calculations and design documents signed & sealed by a Registered Professional Engineer to be included in the submittals.

C. Shop drawings of ductwork air distribution systems submitted by the Contractor will be taken to represent and reflect that the Contractor has thoroughly reviewed and verified adequate clearances for routing of insulated ductwork, including offsets as necessary, where exposed in rooms, above ceilings, within chases, etc.; has been carefully coordinated with other contractors for all other trades and structural elements; and shall accommodate proper access and service clearances for operating equipment and components within the shared space. Engineer's review will be based on this assumption, and acceptance thereof does not relieve the Contractor of responsibility for such conditions.

   a. Any restrictions or obstructions determined by the Contractor as preventing installation of any duct systems shall be brought to the attention of the A/E for resolution prior to beginning any fabrication or installation of new work.

D. Refer to Specification Section 21 0000, paragraph 1.10 for additional requirements.

PART 2 - PRODUCTS

2.01 DUCTWORK, METALLIC

A. All ductwork, except as otherwise specifically noted, shall be constructed of galvanized steel sheets. Ductwork shall also be mill-bonderized (paint grip) where exposed to view.

B. Where square elbows are indicated on the plans, or are otherwise necessary, turning vanes equal to "Tuttle & Bailey" Ducturns shall be installed. Shop-built double-vane turning vanes, constructed to SMACNA duct manual standards will be acceptable. Rounded elbows indicated shall have a minimum turning radius of 1-1/2 times the width of the duct in the plane of the bend.

C. At each split-tee, at each branch from a high or low-pressure main duct, and at each sweeping takeoff to an air outlet, there shall be provided a splitter or take-off damper with an adjusting device. At all other takeoff boots to air outlets of any type, as well as all exhaust takeoffs and branches, there shall be provided an approved dampering device for effecting volume control. Volume damper with adjustable device shall also be provided at main return air duct at each air handling unit, A/C unit and heat pump unit, located upstream of outside air connection. Similar additional dampering devices shall be provided at specific locations as directed by the Test & Balance Contractor and/or as otherwise required for proper balancing of air systems, whether or not shown on the drawings.

D. Splitter and volume dampers shall be shop-constructed of same materials as ductwork. Damper rods shall be square steel rods with "U" bolts, "Young" Type CRS No. 660, or equal. End bearings shall be equal to "Young" No. 654, 5, 6, 9, or equal.

E. All duct dampers in concealed areas or above inaccessible ceilings shall be provided with damper regulators including "Young" No. 301 locking nut regulator with concealed C.P. cover, "Young" No. S-900 threaded steel cable rod, "Young" No. 912 or 914 operators; as required for complete assemblies.

F. All forced air inlets to, or outlets from the building shall be provided with 18 gauge galvanized steel wire screens, in suitable removable frames of same material as the outlet or inlet, except as otherwise noted.

G. All duct sizes indicated on the drawings represent inside free-air dimensions. All ductwork shown as double-wall construction, shall have outer sheetmetal dimensions increased accordingly to allow for interior insulation thicknesses.

H. Where indicated, all round and rectangular ducts and plenums shall be double-wall construction with SOLID OR PERFORATED interior sheetmetal lining as noted on the drawings, and with minimum 1-1/2" internal acoustic fiberglass insulation between inner and outer walls; similar and equal to "United McGill" K27. All sheetmetal construction shall be as specified herein, and internal insulation shall be as specified for acoustic duct lining. All duct joints and seams shall be flat locking-seams; i.e., perpendicular flanges will not be permitted. All ductwork located in areas exposed to view such as gymnasiums or other areas with no ceiling, shall be provided with a “paint grip” finish.

1. Internal insulation and sound absorption material for double-wall rectangular and round ducts shall be 1-1/2" thick neoprene coated glass fiber insulation; similar and equal to "Fiberglas Aeroflex" coated duct liner, 1.5 lbs./cu.ft. minimum density. Material shall meet the Erosion Test Method described in UL Publication No. 181, and shall be applied with anti-microbial agent. Linings, coverings, vapor barriers, and the adhesives used for applying them shall have a flame spread classification of not more than 25 and smoke developed rating of not more than 50.

2. Insulation thickness and thermal performance shall meet R-value requirements as specified under Section 23 0700 – HVAC INSULATION.

3. Duct sizes noted on the drawings for double-wall or internally lined ducts are free air inside dimensions. Sheetmetal dimensions shall be increased to account for insulation thickness.

I. All round main ducts shall be constructed as to withstand up to 10.0" W.G. static pressure. Round branch ducts to air devices may be of snap-lock construction rated not less than 2” W.G. static pressure.

J. Exhaust ducts serving kitchen hood exhaust and dishwasher exhaust shall be 16-gauge minimum, constructed of stainless steel sheets, all welded construction.

K. All rectangular and round low pressure and high-pressure ductwork shall be constructed to SMACNA Duct Manual Standards for Low Velocity and High Velocity ducts, as appropriate. All ductwork shall be minimum 24 gauge and as required by U.L. Design 246 or 509.

2.02 DUCTWORK; FLEXIBLE

A. Flexible ductwork shall be limited to low pressure supply air systems only, from supply ducts to ceiling diffuser or air terminal, and shall be "Thermaflex" Type M-KC, or equal, coated reinforced glass fabric or aluminum laminate liner bonded over corrosion-resistant heavy gauge steel wire helix, and with a factory-applied 3/4 pound density glass fiber insulation having an exterior reinforced metalized vapor barrier jacket. Duct insulation shall be 1.5”-2” thick to meet R-value ratings as specified under SECTION 23 0700 – HVAC INSULATION. Flexible ductwork shall be U.L. labeled, and rated to withstand not less than 6" of water gauge pressure without leakage, and not less than 5500 fpm of internal air velocities without deterioration. Flexible ductwork shall be constructed in conformance with NFPA standards, Bulletin 90A, for a flame spread rating of not more than 25 and a smoke developed rating of not more than 50.

B. Manufacturer's rated R-value shall be identified on all flexible duct at intervals no greater than 10'-0" in accordance with the International Energy Conservation Code.

2.03 ACOUSTICAL DUCT LINING

A. Where noted on the drawings, ductwork shall include internal acoustical duct lining.

B. Lining shall be internal insulation and sound absorption material with neoprene coated glass fiber insulation; similar and equal to “Fiberglas Aeroflex” coated duct liner, 1.5 lbs./cu.ft. minimum density. Material shall meet the Erosion Test Method described in UL Publication No. 181, and shall be applied with anti-microbial agent to prevent mold growth. Linings, coverings, vapor barriers, and the adhesives used for applying them shall have a flame spread classification of not more than 25 and smoke developed rating of not more than 50.

C. Insulation thickness shall be 1-1/2” minimum unless otherwise noted, and thermal performance shall meet R-value requirements as specified under Section 23 0700 – HVAC INSULATION.

2.04 AIR DISTRIBUTION DEVICES

A. Air distribution devices shall be fabricated of steel or aluminum, and shall be standard factory-manufactured products, constructed and rated in accordance with the recommendations of the Air Diffusion Council.

B. All air distribution devices shall include integral neck flanges for duct connections. Neck sizes shall be as shown on the drawings.

1. For ceiling diffusers, supply registers, and return and exhaust grilles to be installed in lay-in ceiling grids, sizes shown on the drawings represent overall grille size including perimeter frame, so as to fit the dimensions of the tee-grid. Perimeter frames shall be thin-frame style to maximize grille core, and shall include full perimeter neck flange for duct connections. Air device manufacturer shall coordinate with Sheetmetal Contractor for proper size of connecting ducts.

C. Blade spacing, horizontal and/or vertical, in all supply, return or exhaust grilles and registers shall not exceed .67".

D. Except where otherwise noted, all wall and ceiling units shall have baked enamel (satin anodized for exposed aluminum) finish; color as selected by the Architect.

E. Air devices specified represent the minimum standard of quality required for this project. Equivalent styles and types of air devices furnished by the following manufacturers will be acceptable:

1. Krueger
2. Titus
3. Tuttle & Bailey
4. Nailor
5. Metal-Aire
6. Price

F. Grilles, registers, and outlets shall conform to the following:

MARKDEVICE

"A" Square ceiling diffuser, four-way blow, equalizing deflector, with integral face-plate arranged for installation in a 24" x 24" lay-in ceiling grid; "Krueger" Series 1400, or equal.

“B” Ceiling return or exhaust grille with ½” x ½” x 1” thick aluminum grid core, minimum width frame, loose-key opposed blade volume damper (exhaust grilles only), arranged for installation in a 24” x 24” lay-in ceiling grid; “Krueger” Series EGC-15, or equal.

“C” Same as “A”, except with faceplate arranged for installation in a gypsum board ceiling.

“D” Same as “B”, except with frame arranged for installation in a gypsum board ceiling.

“E” Ceiling or sidewall supply register, steel construction, with removable core, loose-key opposed blade volume damper, horizontal front blades, 1/2” spacing, and double deflection arranged for installation in a 24”x24” lay-in ceiling grid, gypsum board ceiling, or gypsum board or masonry wall, as shown; “Krueger” Series 4880, or equal.

“F” Sidewall return or exhaust grille, steel construction, with 1/2” horizontal fins at 35^{o} to 45^{o} down and integral faceplate, loose-key opposed blade volume damper (exhaust grilles only) for installation in a gypsum board wall; “Krueger’ S85H, or equal.

“G” Square ceiling diffuser, two-way blow, louvered face, loose-key opposed blade volume damper, square or rectangular inlet connection, with integral frame arranged for installation in a 2x2 lay-in ceiling as indicated, “Krueger” Series SH, or equal.

2.05 FANS

A. Fans specified in the following paragraphs represent the minimum standard of quality required for this project. Equivalent styles and types of fans furnished by the following manufacturers will be acceptable:

1. Cook
2. Greenheck
3. Twin City
4. Penn

B. Roof-mounted exhaust fans shall, except as otherwise noted, be low-silhouette type with spun-aluminum weatherproof housings, backwardly inclined welded or riveted aluminum wheel centrifugal blowers, self-acting anti-backdraft dampers, aluminum bird screens, pre-wired disconnect switches, resiliently mounted motors, drives, ventilated motor compartments, etc., as required for complete units. Fans shall be direct drive units where available as scheduled on the drawings, otherwise belt drive. Direct drive fans shall include variable speed fan control for air flow adjustment. Belt-driven fans (except as otherwise noted) shall have the driving motor mounted at one side with the shaft vertically upward to minimize height of unit. Fans shall be "Cook" Model ACE, or equal.

C. Roof-mounted kitchen hood and dishwasher exhaust fans shall, except as otherwise noted, be upblast type, U.L. listed for Type I hood application, with round spun-aluminum weatherproof housings, backwardly inclined welded or riveted aluminum wheel centrifugal blowers, pre-wired disconnect switches, resiliently mounted motors, drives (direct or V-belt as indicated on the plans), ventilated motor compartments, etc., as required for complete units. Fans shall have the driving motor located outside the air stream, protected by a “heat-shield”. Motor shall be T.E.F.C. and may be located with the drive shaft vertically downward. Fan assembly shall be completely non-sparking. Construction shall be similar and equal to “Cook” Model VCR.

D. In-line exhaust and outside air fans shall be "Cook" Model SQN, or equal, cabinet style blow-through fan, complete with belt-driven blower with belt guard, galvanized steel cabinet with baked enamel finish, side or rear inlet as indicated, internal vibration isolators for blower & motor assemblies, DWDI forward-curved blower wheel, heavy-duty T.E.F.C. motor, backdraft damper, pre-wired disconnect switch, and flanged duct connections with neoprene gasket.

E. Propeller recirculation fans shall each be a fabricated unit, with case aluminum air foil propeller fan bolted to central aluminum hub with safety retainers, cylinder housing with helical gear reducer, permanently lubricated drive with lip seals, resiliently-mounted motor, steel mounting frame and post, disconnect switch, roof mounting bracket, and baked enamel finish; “Big Ass Fan” PowerFoil Series. Each fan shall include factory U.L. Listed unit-mounted variable frequency drive (VFD), and remote wall-mounted variable-speed control switch for fully variable airflow control.

F. Each roof-mounted fan shall be provided with a factory-fabricated roof mounting curb which shall mate with its fan to provide support and complete weathertight installation when installed. Each curb shall be 18" high minimum full-perimeter type, all-welded construction of 16 gauge minimum zinc-coated steel, properly braced and reinforced to support each fan. Each curb shall include treated 1" x 4" wood nailer strip, top flange with outer lip, and strip-top gasketing as required to provide proper continuous seal. Curbs shall be internally insulated in an approved manner.

1. Installation of each roof-mounted fan unit and roof curb shall be in accordance with wind load requirements prescribed in the International Building Code. Each curb shall be constructed and rated to meet design wind speed (V_ult) of 120 MPH, under building Exposure Category C of the IBC, and in accordance with other criteria defined in the Structural Drawings. Each curb shall include wind restraint brackets to secure each fan unit to its curb, as well as base flange anchored to roof structure. Refer to Structural Drawings for structure and angle framing being provide for each unit on the roof.

2. Roof curb assemblies for kitchen hood exhaust fans shall include U.L. Listed vented extensions as required for grease hood exhaust application.

3. Contractor and unit manufacturer shall refer to Architectural Specifications and Details for additional roof curb requirements. Each curb shall be arranged to accommodate external insulation and flashing around the perimeter as detailed.

4. Contractor shall provide wood blocking and shimming at the base of each curb, as required to maintain minimum flashing heights and insure level installation of each fan unit.

G. Where scheduled and indicated on the drawings, fans shall also include remote wall-mounted thermostats to cycle respective fans to maintain space temperature setpoint (adjustable).

H. Except as otherwise noted, fan motors shall be ball-bearing type, permanently lubricated, open frame, 1750 RPM, equipped with thermal overload protection.

I. Fan capacities shall be as indicated on the plans.

2.06 COMBUSTION AIR, OUTSIDE AIR, AND RELIEF AIR INTAKES

A. Intakes on roofs for combustion and relief air shall be "Cook" Model PR, or equal, low-silhouette, unfiltered, spun aluminum roof housings with aluminum bird screens, sized and installed as indicated on the plans. Construction and mounting bases shall be as specified for exhaust fans, except that sound isolating media is not required.

B. Outside air intakes for general ventilation shall be "Cook" Model GI, or equal, and shall also include permanent washable filters. Intakes shall otherwise be similar in construction and mounting as specified in Subparagraph A. above.

2.07 FIRE DAMPERS AND FIRE/SMOKE DAMPERS

A. Fire dampers shall be single-blade or multiple-interlocked blade type to suit the conditions. All fire dampers shall be constructed to standard of NFPA Pamphlet #90A and supplements for not less than 1-1/2 hours protection, except as otherwise noted, shall be U.L. labeled, and each shall be fitted with a 160° fusible link. Stainless steel negator springs and blade locks shall be utilized in horizontal installations. Fire dampers shall be equal to “Air Balance” Model 119A for openings without ductwork attachment and Model 119B with extended damper head for dampers in low velocity dampers which shall have not less than 95% free open area.

B. Combination fire/smoke dampers shall be “Ruskin” Model FD-35, or equal, 1-1/2 hour U.L. and NFPA approved damper assembly having multiple interlocking rated damper blades, 165°F fusible link for fire closure, spring return damper rod and motorized actuator operated by smoke detector for smoke closure, negator springs for horizontal installation, etc., for a complete assembly. Each damper shall be constructed to allow for required testing of smoke damper operation without compromising fusible link integrity. Upon detection of products-of-combustion, smoke detector shall close damper and energize fire alarm system. Free area shall be 95% of attaching ductwork. Operator voltage shall be 120 volt or 24 volt as compatible with fire alarm system.

2.08 LOUVERS (NON-STORM RATED)

A. Wall louvers shall be weatherproof stationary type designed to prevent any moisture entry. Louvers shall be of extruded aluminum construction, with horizontal angled sightproof blades, aluminum bird screen, 50% free air minimum, and rate to resist wind-driven rain. Louvers shall be provided in a color as selected by the Architect; “Ruskin” EME720, or equal.

2.09 FLUES

A. Each flue shall be approved double-metal-wall Class “B” appliance vent, similar and equal to “Metalbestos”, “Van Packer”, or “Amerivent”. Flue caps shall be galvanized steel anti-backdraft type, “Breidert” Type L, or equal, with flashing base suitable for roof system specified.

2.10 VIBRATION ISOLATION

A. Isolators for suspended air conditioning units, heat pump units, or fans shall be steel spring type with leveling devices. Springs for units or fans of less than 2,000 cfm shall have not less than 1" static deflection; and all larger units shall have a minimum of 2" static deflection. The size, number and location of the isolators shall be as recommended by the equipment manufacturer.

B. Sound pads shall be provided for all floor-mounted units. Pads shall be fabricated of a layer of cork between two layers of grooved neoprene, bonded together, and 1" thick unless otherwise noted.

C. Vibration isolation media shall be as manufactured by "Korfund", "Amber Booth", or "Vibration Mountings, Inc.".

PART 3 - INSTALLATION

3.01 DUCTWORK

A. The Contractor shall furnish and erect all supply, return, outside and exhaust air ventilating ducts, risers, branches, elbows, dampers, etc., necessary to make the complete systems, in accordance with the recommendations of the latest ASHRAE Guide and SMACNA Low Velocity or High Velocity manuals as appropriate, as to gauges, transverse joint connections, bracing, and as indicated on the drawings.

B. All horizontal ducts shall be supported by means of 16 gauge cold-rolled steel channels and No. 12 SWG galvanized steel wire, or by means of solid galvanized steel strap hangers per SMACNA Standards, spaced not more than 6'-0" on centers, and securely fastened into the construction above as required by U.L. Design 246 or 509. All vertical ducts shall be supported with angles riveted to the duct fastened to wall or partitions on not over 6'-0" on centers. All ductwork shall be left clean inside.

C. All rectangular duct panels 12" or larger, not internally lined or externally insulated, shall be cross-broken or beaded.

D. For all ducted systems, sheetmetal branch ducts shall be extended to all air devices (registers, grilles, etc.), and shall be properly connected to neck flange of each air device and sealed airtight with duct mastic. Flexible ductwork shall be limited to air terminal units and ceiling-mounted supply diffusers only, as shown on the drawings and specified herein. Connecting duct sizes shall match the neck size of all associated air devices.

1. Contractor shall provide minor offsets and transitions required to align with exact grille locations.

2. Sheetmetal Contractor shall coordinate exact neck sizes and connection arrangements with air device manufacturer.

E. Ducts shall be installed to leave sufficient head room in all cases, and where it becomes necessary to change the size or shape of a duct to conform to structural or architectural conditions, the Architect must be consulted for resizing or rerouting.

F. Where ducts pierce roof to terminate in cowls, fans, ventilators, etc., adequate flashing and counterflashing shall be provided to exclude any rainwater from entering the building through duct roof penetrations.

1. All duct penetrations through building envelope not otherwise protected shall be caulked, gasketed and sealed as required for weathertight installation.

G. Double-wall duct systems shall be installed as specified herein and in accordance with manufacturer's recommendations.

H. Seams and joints in kitchen hood exhaust ductwork shall be welded watertight, and shall be sloped to drain back to unit at a minimum of 1/8" per foot.

I. All adjustable volume dampers shall be flagged with brightly colored ribbon or tape in accordance with local code authorities.

J. Provide duct access panels at all fire damper and fire/smoke damper locations as required to provide access for internal damper components. Panel shall be insulated, gasketed, with latching devices as required. Access panels shall be identified with permanently affixed labels having letters not less than ½" in height reading: "FIRE DAMPER".

K. An approved mastic duct joint sealant shall be applied at all duct joints and seams in accordance with UL 181. Sealant application shall be of sufficient thickness and coverage to prevent air leaks. Duct tape is strictly prohibited.

3.02 DUCTWORK; FLEXIBLE

A. Flexible ductwork shall be installed in accordance with manufacturer's recommendations, and shall be limited to supply connections to ceiling diffusers only. High velocity, high pressure system ductwork shall connect to the main supply ducts with a conical tee and a short duct collar. Low velocity, low pressure systems shall be provided with a spin-in type duct collar with an adjustable air scoop and adjustable damper. Minimum length of flexible ductwork shall be 18". Maximum length shall be as shown on the plans, but in no case shall length exceed 6'-0".

B. Flexible ducts shall be installed and supported to allow smooth radius turns to air devices, with no sags, folds or crimps. Contractor shall provide strap support and saddle near each air device to provide smooth unencumbered sweep from branch duct to air device connection.

3.03 AIR DISTRIBUTION DEVICES

A. Each supply, return, exhaust, or other duct terminal shall be provided with a grille, register, or outlet as noted on the plans and specified herein. For selection of acceptable diffuser sizes where the standard neck size is other than the specific values indicated on the plans, the following rules shall apply:

1. For rectangular neck diffusers: next larger available dimension

2. For round neck diffusers: a diameter sufficient to handle the specified air quantities at a maximum neck velocity of 500 fpm.

B. Locations of all air devices shall generally follow those arrangements indicated on the drawings, but shall also be installed in coordination with all other ceiling components including light fixtures, speakers, sprinkler heads, etc., as required to provide symmetrical patterns in each space.

C. Mounting frames for grilles and registers shall be installed in time to be painted out with the building surfaces by the General Contractor. All other air distribution devices, including grille cores, shall not be installed until building painting is complete.

D. Interior ductwork visible in back of diffusers, registers, and grilles shall be painted flat black.

3.04 FLEXIBLE CONNECTIONS

A. Furnish and install between each fan unit and connecting ductwork a flexible connection.

B. Flexible connections shall consist of a clean 2" break between metal ducts, jointed by a waterproof and fire-resistant canvas fabric, weighing not less than 20 ounces per square yard. Fabric shall be fastened to ductwork with 1" x 1/8" band iron and sheet metal screws.

3.05 FIRE DAMPERS AND FIRE/SMOKE DAMPERS

A. Fire dampers, fire/smoke dampers, and ceiling radiation dampers shall be provided at all duct and air device penetrations through fire-rated construction, including walls, ceilings, floors, and roof, as indicated on the drawings and otherwise required by applicable construction codes. The Contractor shall carefully review fire-rated drawings and notations in the Architectural Drawings and shall provide all dampers required whether specifically indicated or not.

3.06 EQUIPMENT

A. All types of equipment shall be installed as indicated on the plans, and in strict conformance with the manufacturer's instructions.

B. Roof-mounted fans shall be installed on bases in such a manner as to facilitate convenient access to the self-acting louvers, where provided.

3.07 ROOF CURBS FOR ROOF-MOUNTED FANS

A. Installation of roof-mounted fans and roof curbs shall be in accordance with wind load requirements under the International Building Code, rated for 120 MPH wind speed, building Exposure Category C; and as detailed and noted on the Structural Drawings. Each curb shall be anchored to roof structure per Structural Drawings, and equipment shall be secured to curb with wind restraint brackets.

B. Unit and curb installation shall also be in accordance with Manufacturer’s instructions, and shall be installed in such a manner as to facilitate convenient access to self-acting backdraft or control dampers, where provided.

C. Contractor shall provide wood blocking and shimming at the base of each curb, as required to maintain minimum flashing heights and insure level installation of each fan unit.

D. Contractor shall refer to Architectural Specifications and Details for additional roof curb requirements. Each curb shall be arranged to accommodate external insulation and flashing around the perimeter as detailed.

3.08 VIBRATION AND NOISE CONTROL

A. Transmission of perceptible vibration, structure-borne noise or objectionable air borne noise by and/or from equipment installed to occupied areas will not be permitted. The Contractor shall submit for approval data showing disturbing frequency, support weight, static deflection or natural frequency and efficiency for each isolator and damper he proposes to use.

B. All isolation material selections are to be based on laboratory published or factory certified data, proving that all such materials and usage comply with these specifications. Should any noise or vibration be objectionable to the Engineer, field instrumentation tests and measurements shall be made by the Contractor to determine the source, cause, and path of such disturbance. The Contractor shall correct any variance or non-compliance with the specification requirements in an approved manner at no additional cost to the Owner.

C. All A/C units and fans shall be isolated from the building structure. In all cases, care must be taken to insure that all connections to the unit be sufficiently resilient to allow full undamped functioning of the unit isolators. This includes electrical raceway, ducts, drain, piping, etc.

3.09 TESTING & BALANCING

A. Testing and balancing shall be performed by the selected TAB Contractor in accordance with the Testing & Balancing Specifications, as a separate subcontract. The Mechanical Contractor shall coordinate and support all TAB services as specified. Should the TAB Contractor determine any degree of unsatisfactory installation or operating condition of a related nature, this Contractor shall provide such additional correctional work as may be necessary to properly resolve the reported difficulties, without additional compensation (see Section 23 9900).

B. In event of disagreement as to the necessity and/or scope of such correctional effort, or as to the satisfactory completeness thereof, the decision of the Owner and Engineer shall be final.

END OF SECTION

SECTION 23 8000

UNITARY HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

1.02 SCOPE

A. This section of the specifications includes all labor and materials required for the finished and complete installation of the various heating, ventilating and air conditioning equipment, facilities and systems.

B. Involved in the classification of heating, ventilating and air conditioning work above are the following systems:

1. Unitary air conditioning and gas heating
2. Miscellaneous, as indicated on the plans

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Piping
B. Valves, strainers and unions
C. Insulation
D. Material storage and handling
E. Air distribution
F. Fans
G. Motor starters

1.04 SUBMITTALS

A. Submit manufacturers certified rating data, descriptive literature, and catalogue cuts for all proposed equipment items as follows:

a. Package rooftop A/C units
b. Package rooftop make-up air A/C units
c. Air filters
d. Vibration isolation

B. Submittals for roof-mounted equipment shall include detailed construction literature for units and roof curbs, including wind load resistance ratings in accordance with the specifications and meeting the wind load requirements in the International Building Code. Wind resistance ratings

shall be supported by calculations and design documents signed & sealed by a Registered Professional Engineer to be included in the submittals.

Refer to Specification Section 21 0000, paragraph 1.10 for additional requirements.

PART 2 - PRODUCTS

2.01 PACKAGE ROOFTOP A/C UNITS

A. Each unit shall be draw-through, single zone, down-discharge type as indicated. Unit shall be factory-assembled, piped, internally wired, fully charged and designed to operate at outdoor ambient temperatures as high as 120°F. Refrigerant shall be R-454b. Units which are eleven (11) tons or less shall comply with ARI Standard 210 and units which exceed eleven (11) tons shall comply with ARI Standard 360, or acceptable equivalent. Unit shall be listed by Underwriters' Laboratories, Inc. (or an acceptable equivalent), and all wiring shall comply with National Electrical Code. Unit shall be designed for outdoor rooftop installation, and exterior surfaces shall be phosphatized, zinc-coated steel with epoxy resin primer and baked enamel finish or approved equal.

B. Units shall be arranged for bottom duct connections inside the roof curbs. Side duct connections shall be provided only where noted on the drawings.

C. Unit shall have serviceable hermetic or welded shell hermetic, 3600 rpm, heavy-duty type compressor(s) with internal spring vibration isolation and crankcase heaters. Each refrigerant circuit shall include thermostatic expansion valve control (or approved equivalent) for each evaporator coil, service port valves, refrigerant head pressure control, and low ambient control for operation down to 15^{o}F outside ambient temperature. Refrigerant circuit to each compressor shall include service isolation valves, where available.

D. Contactors with 24-volt control circuit shall be provided for condenser fan, evaporator fan and compressor. Safety devices shall include high and low pressure switches, adjustable time delay on compressor cycling, winding thermostat, and manual reset compressor overloads. Each unit shall also include phase protection and low-voltage protection.

E. Refrigerant coils shall be of copper tube and aluminum finned construction, with not less than 7 fins to the inch of tubes. Evaporator coils shall have no more than 15 fins to the inch and shall be factory pressure and leak tested at not less than 500 psig. Condenser coils within units, regardless of tonnage, shall have no more than 20 fins to the inch. Condenser coils shall be factory pressure and leak tested at not less than 420 psig, and shall be protected by coil guards against hail damage.

F. All units at 3 tons and greater shall be multi-stage and variable air flow A/C units, arranged for dehumidification capabilities and control operation as follows:

1. Units shall each include a minimum two-stage compressor arrangement with two-stage temperature control and 2-speed variable fan speed control for reduced supply air at low-cool, in order to maintain humidity levels during lighter load conditions.

    a. Large units with more than two stages of cooling shall be controlled for multiple fan speeds in association with each cooling stage.

2. Units shall also include minimum 2-stage gas heaters with associated fan speed control for each heating stage.

3. Designated units scheduled on the drawings shall each include hot gas reheat coil assembly located downstream of the DX evaporator coil, that utilizes refrigerant hot gas for reheat operation during dehumidification mode. Assembly shall include reheat coil of similar construction as specified for DX evaporator coil, with hot gas refrigerant piping and service valves, diverting solenoid and control valves, etc., for complete assemblies.

4. Unit controllers and associated components shall be compatible for remote temperature and humidity control as applicable provided through the building DDC and EMS control system (see specified sequence of operation under SECTION 23 9000 – DDC ENERGY MANAGEMENT SYSTEM).

G. Each unit shall include factory leak detection system of refrigerant circuits with automatic safety shutoff, required for R-454b refrigerant in accordance with International Mechanical Code.

H. Unit supply fan shall be direct drive, forward curved, centrifugal type with variable or multi-speed motor, subject to proper speed control adjustment as required to meet actual design flow rates. Large units may be belt driven with adjustable motor sheaves and control adjustment, including replacement of motors, drives, sheaves, etc., if required, at no additional expense to the Owner. Thermal overload protection shall be provided for motors. Fan and motor bearings shall be permanently lubricated. Motor fan assembly shall be completely isolated from unit with rubber mounts.

1. For all units 3 tons and greater, fans shall include multi-stage air flow control via factory ECM or VFD, as specified.

I. Units at 7.5 tons and greater shall include two or more compressors and refrigerant circuits, with variable lead compressor and staged control for lag compressors.

J. Condenser fans shall be direct drive, statically and dynamically balanced, with motors U.L. listed for outdoor use. Built-in thermal overload protection shall be provided for each motor. Motor bearings shall be permanently lubricated.

K. Casings shall be fully braced, and so arranged that all internal parts are fully accessible through side access panels. Access panels shall be hinged with latching devices (or equivalent). Unit casings shall be galvanized steel construction with internal insulation. Insulation shall be internal, glass fiber with reinforced foil-faced vapor barrier, or equal, not less than 1/2" thick, 1 pound density, and having a "K" factor of not higher than .25.

L. Unit drain pan shall be of stainless steel construction. Drain pan insulation shall be similar to casing insulation in thickness and "K" value, and shall be protected by a complete sheet stainless steel inner pan to which the drain connections attach. Drain pan insulation may be omitted if the pan is arranged so that condensate within the pan cannot produce condensation on the outside of the unit casing.

1. Unit drain pan shall include overflow float-switch or electronic monitoring switch that shall disable unit upon detection of high water level in pan, to prevent overflow.

M. All units shall include a watertight outside air hood with motorized control damper capable of admitting up to 35% outside air (100% air for economizer control), and installed with bird screen protection. Damper assembly shall be “low-leak” type of galvanized steel construction with gasketed edges, and with blades, linkages, shafts, bearings, etc., for complete assemblies.

1. Outside air damper shall open to minimum design outside air flow rates scheduled on the drawings whenever unit fan is energized, and shall close whenever unit fan is de-energized. Damper shall be compatible for external EMS control to keep damper closed during unoccupied setback operation.

2. All units designated for CO_2 control shall include fully-modulating outside air control dampers for CO_2 control by building DDC/EMS as specified under Section 23 9000 – DDC Energy Management System.

3. Designated units shall be provided with an economizer cycle assembly as scheduled on the drawings, with 0-100% fully-modulating outside air control dampers, return air control dampers, and barometric relief air dampers, to provide "free-cooling" based on enthalpy control by building DDC/EMS as specified under Section 23 9000 – DDC Energy Management System. Assembly shall include preset minimum O.A. position, and air hoods with insect screens.

4. Each type of damper assembly specified above shall be furnished and arranged to accommodate external DDC ventilation control to be furnished and installed by the EMS Control Contractor (refer to Section 23 9000 – DDC Energy Management System). Damper and shaft arrangements shall be compatible for mounting and installation of “Belimo” control operators to be furnished and installed by the EMS Control Contractor.

N. Each unit shall include a filter holding frame for 2” filters as specified under AIR FILTERS. Filter section shall include hinged access doors with latching devices.

O. Unit shall be provided with complete and functional gas heating section as indicated on the drawings. Heating section shall be completely factory assembled, wired and AGA certified for outdoor application, with heat exchangers of stainless steel construction. Aluminized steel may be considered only if offered with extended heater warranty specified. Burner shall be an industrial type in-shot power burner with air proving switch that shall prove blower operation before allowing burner operation. Burner shall include gas regulator and control valve for minimum 2-stage heating control as specified. Control valve shall be non-vented type. Burner shall be provided with electric ignition with continuous electronic flame supervision and 100% safety shutoff.

P. Unit components shall include minimum non-prorated replacement warranties as follows:

1. All Parts: Ten (10) Years
2. Heat Exchangers: Fifteen (15) Years

Q. Unit shall be rated for premium SEER and EER efficiency in accordance with ARI Conditions, as available. Ratings shall exceed minimum requirements scheduled on the drawings and set forth under the International Energy Conservation Code, latest edition.

R. Each unit shall be provided with a factory-fabricated roof mounting curb which shall mate with its rooftop unit to provide support and complete weathertight installation when installed. Each curb shall be 18" high minimum full-perimeter type, all-welded construction of 16 gauge minimum zinc-coated steel, properly braced and reinforced to support each unit. Each curb shall include treated 1" x 4" wood nailer strip, top flange with outer lip, and strip-top gasketing for supply/return ductwork and for unit perimeter as required to provide proper continuous seal. Curbs shall be internally insulated in an approved manner.

1. Installation of each A/C unit and roof curb shall be in accordance with wind load requirements prescribed in the International Building Code. Each curb shall be constructed and rated to meet design wind speed (V_ult) of 120 MPH, under building Exposure Category C of the IBC, and in accordance with other criteria defined in the Structural Drawings. Each curb shall include wind restraint brackets to secure each A/C unit to its curb, as well as base flange anchored to roof structure. Refer to Structural Drawings for structure and angle framing being provide for each unit on the roof.

2. Vibration Isolation Curbs: Certain rooftop A/C units serving sound-sensitive spaces shall be provided with sound isolation roof mounting curbs where noted on the drawings. Each isolation curb shall include separate unit and deck rails with internal steel spring isolators having a minimum 2" deflection, weathertight gasketed access panels for isolators, and 1" thick 1.5 lb. density insulation at curb and deck; "Vibro-Acoustics", or equal.

3. Contractor and unit manufacturer shall refer to Architectural Specifications and Details for additional roof curb requirements. Each curb shall be arranged to accommodate external insulation and flashing around the perimeter as detailed.

4. Contractor shall provide wood blocking and shimming at the base of each curb, as required to maintain minimum flashing heights and insure level installation of each A/C unit.

S. All unit microprocessors and controllers shall be fully compatible with DDC building automation system and District EMS control system, to accommodate remote control and monitoring by the building DDC, including heating, cooling and dehumidification commands, fan control, ventilation control, etc. (Refer to Section 23 9000 – DDC Energy Management System.) Each unit shall also be furnished by its manufacturer and/or have installed by the Mechanical Contractor the following components available for DDC/EMS control:

1. 24 VAC control transformer and all control relays required, with factory wiring to all equipment-mounted control devices, sensors and unit controllers. Factory unit controllers shall include individual control connection points or pre-wired terminal strips for external DDC control. Controllers, terminal strips and unit wiring thereto shall be suitable for direct interface with individual control & monitoring points from building DDC controller, to provide for all specified heating/cooling temperature, humidity, ventilation, and switching control functions. Use of Bacnet communication ports or gateways as the primary means of DDC interface will not be acceptable. Factory unit controller shall include BacNet interface communication port, but utilization shall be limited to additional secondary monitoring points available to the DDC Operator.

2. Connection points and associated unit wiring to accomplish the following results in response to remote commands from the building DDC and Energy Management System (EMS):

   a. Fan control, start/stop
   b. Cooling stage 1 control, start/stop
   c. Cooling stage 2 control, start/stop
   d. Dehumidification control, start/stop
   e. Heating stage 1 control, start/stop
   f. Heating stage 2 control, start/stop
   g. Automatic fan speed control with each cooling/heating stage
   h. Outside air CO_2 control
   i. Economizer control
   j. Outside air damper shut-off control during night setback

3. Unit manufacturer shall furnish complete job specific wiring diagram for each type of unit to the EMS Control Contractor for proper coordination of remote DDC control.

T. Each A/C unit shall include U.L. listed Short Circuit Current Rating (SCCR) in accordance with NEC. Minimum SCCR rating for each unit shall be not less than 5kA at rated voltage.

U. Each A/C unit shall include stamped nameplate identification affixed to the exterior cabinet. Nameplate data shall include Manufacturer, Model No., Serial No., Unit volts, phase, MCA & MOCP, electric data for each component, gas heating input & pressure, and unit Short Circuit Current Rating (SCCR) in accordance with NEC.

1. SCCR identification will not be required for any unit under 60 amp FLA.

V. Unit capacities shall be not less than those scheduled on the drawings. Units shall be as manufactured by the following:

1. “Aaon” Series RQ/RN
2. “Lennox” Series LGH
3. “Trane” Series:
   a. YCC below 3-ton
   b. Precedent YHC-17 SEER 2-stage 3-5 ton
   c. Precedent YHC 2-stage 7.5-10 ton
   d. Voyager above 10 ton

2.02 PACKAGE ROOFTOP MAKE-UP AIR A/C UNITS

A. Package rooftop make-up air A/C units shall be provided for Kitchen cooking hood makeup air systems, as indicated. Units shall be constructed for high outside air application, and shall be factory assembled, tested, piped, internally wired and shipped in one piece, complete with an operating charge of R-454b refrigerant and oil. Units shall have direct expansion cooling and gas heating. Units shall be complete with all operating and safety controls. All units shall be factory test run in the cooling and heating modes with following information being recorded for each individual unit: amperage for each electrical component, suction and discharge pressures with corresponding ambient temperatures and relative humidity, gas flow rate to burner, and verification of operation of all safeties by simulating condenser fan and evaporator blower failures.

Provide all test information along with a wiring diagram and a maintenance and operational manual inside each unit. Unit capacities shall meet those scheduled on the drawings, and shall be rated in accordance with A.R.I. standards. Unit shall be UL or ETL listed, and certified in accordance with ANSI Standards. Unit shall be equipped with factory installed lifting lugs.

B. Each unit shall include factory leak detection system of refrigerant circuits with automatic safety shutoff, required for R-454b refrigerant in accordance with International Mechanical Code.

C. Unit casings shall be phosphatized G90 galvanized steel with factory baked acrylic-epoxy paint or enamel finish. Units shall be full double-wall construction. All assembly screws shall be zinc-chromate coated. Access to compressors, controls, filters, blower, heating section and other items needing periodic checking or maintenance shall be through hinged double-wall access doors with quarter turn vent-lock type latches. Airside service access doors shall be fully gasketed, with rain break overhangs.

D. All double-wall sections shall include interior galvanized steel liner with 1” thick minimum interior foam insulation. The unit casing shall be assembled in such a manner to be waterproof and provide for natural drainage. Drain pans and floor areas shall be insulated on the underside. The unit base shall be water tight and constructed with 14-gauge load bearing members. The unit shall have a factory provided entryway within the cabinet for all wiring to enter from the side or from below within the confines of the roof curb where provided.

E. Units shall each include a refrigeration system with 100% modulating hermetic scroll compressors with VFD modulating control, and factory installed isolation mounting. Compressors shall have separate refrigerant circuits, with fully modulating cooling and capacity control. An oil level sight glass, oil charging valve and two-point lubrication for each connecting rod shall be standard. Compressor motors shall be suction gas cooled, provided with crankcase heaters and voltage utilization range of plus or minus 10% of nameplate. Two (2) winding thermostats shall be embedded between the motor windings. Compressor(s) shall be mounted in an isolated compartment to permit operation of the unit without affecting air flow when the compressor compartment is open. Standard safety controls shall include manual reset high-pressure refrigerant cutout and automatic reset low-pressure refrigerant cutout, and adjustable freezestat for evaporator coil. The lead refrigerant circuit shall be equipped with suction pressure actuated hot gas bypass. Units shall be provided with low-ambient control down to 0^{o}F ambient temperature. All circuits shall be equipped with refrigerant service valves, solenoid valves, and liquid line sight glasses. System shall have liquid line driers and be fully charged with R-410a. Compressors shall have a ten (10) year warranty.

F. The evaporator coil shall be constructed of seamless copper tubing mechanically bonded to heavy-duty aluminum fins, and epoxy polymer E-coating. Coils shall be 6-row minimum (if available) with galvanized steel casings and shall have equalizing type vertical tube distribution with top suction connection. The coil shall be equipped with thermostatically controlled expansion valve for each circuit. The circuits shall be intertwined in the coil. The unit shall be equipped with a 5-minute anti-short cycle delay timer for each compressor. Coils shall be factory pressure and leak tested at 300 PSIG.

G. Evaporator coil shall be provided with sloped stainless steel condensate drain pan. Unit drain pan shall include overflow float-switch or electronic monitoring switch that shall disable unit upon detection of high water level in pan, to prevent overflow.

H. The condensing coil shall be fabricated of 3/8" OD seamless copper tubing with configured aluminum fins mechanically bonded to copper tubing. Condenser coil shall be designed for a minimum of 10° sub-cooling. Coils shall be factory tested to 450 PSIG air pressure and then vacuum dehydrated. Condensing coils shall be protected with heavy-duty coil hail guards.

I. Condenser fans shall be of the vertical discharge type with direct drive fans. Fans shall have steel blades and zinc plated steel hubs and shall be statically and dynamically balanced. Motors shall have permanently lubricated ball bearings, built in current and thermal overload protection and weathertight slingers over bearings.

J. All supply air fans shall be rated in accordance with AMCA Standard Test Code, Bulletin 210. Fans shall be direct-drive with multi-speed fan settings, single inlet, backwardly inclined plenum fans with adjustable sheave drives. Fan motors 1 Hp and larger shall be T.E.F.C. high-efficiency type with thermal overload protection. Fans shall be statically and dynamically balanced. Fan bearings shall be self-aligning, grease lubricated ball or roller bearings, of the pillow block type with 200,000 hour bearing design, easily accessed for servicing.

K. All units shall include a watertight outside air hood with motorized control damper capable of admitting up to 65% outside air and installed with bird screen protection. Damper assembly shall be “low-leak” type of galvanized steel construction with gasketed edges, and with blades, linkages, shafts, bearings, etc., for complete assemblies.

1. Outside air damper shall open to minimum design outside air flow rates scheduled on the drawings whenever unit fan is energized, and shall close whenever unit fan is de-energized. Damper shall be compatible for external DDC/EMS control to keep damper closed during unoccupied setback operation.

2. Unit shall be provided with an economizer cycle assembly as scheduled on the drawings, with 0-100% fully-modulating outside air control dampers, return air control dampers, and barometric relief air dampers, to provide "free-cooling" based on enthalpy control as specified under Section 23 9000 – DDC Energy Management System. Assembly shall include preset minimum O.A. position, and air hoods with insect screens.

3. Each type of damper assembly specified above shall be furnished and arranged to accommodate external DDC ventilation control to be furnished and installed by the EMS Control Contractor (refer to Section 23 9000 – DDC Energy Management System). Damper and shaft arrangements shall be compatible for mounting and installation of “Belimo” control operators to be furnished and installed by the EMS Control Contractor.

L. Heating Section:

1. Induced draft combustion type, UL and AGA approved, with energy saving direct spark ignition system and induced draft blower and an electric differential pressure switch to lock out the gas valve until the combustion chamber is purged and combustion air flow is established.

2. The heat exchanger shall be of the tubular section type with multiple concavities constructed of a minimum of 20-gauge stainless steel for corrosion resistance.

3. Burners shall be of the in-shot type constructed of stainless steel. Each unit shall have 20%-100% fully-modulating burners.

4. All gas piping shall enter the unit cabinet at a single location.

5. Unit tubular gas heat exchanger shall carry a 15-year warranty.

M. Provide filter racks and holding frame with two-inch (2") thick pleated 30% efficient MERV8 replaceable media filters as specified under AIR FILTERS.

N. Each unit shall be down-discharge within roof curb for roof-mounting, as indicated on the drawings.

O. Unit components shall include minimum non-prorated replacement warranties as follows:

1. All Parts: Ten (10) Years
2. Heat Exchangers: Fifteen (15) Years

P. Unit shall be rated for premium SEER and EER efficiency in accordance with ARI Conditions, as available. Ratings shall exceed minimum requirements scheduled on the drawings and set forth under the International Energy Conservation Code, latest edition.

Q. Each unit shall be provided with a factory-fabricated roof mounting curb which shall mate with its rooftop unit to provide support and complete weathertight installation when installed. Each curb shall be 18” high minimum full-perimeter type, all-welded construction of 16 gauge minimum zinc-coated steel, properly braced and reinforced to support each unit. Each curb shall include treated 1” x 4” wood nailer strip, top flange with outer lip, and strip-top gasketing for supply/return ductwork and for unit perimeter as required to provide proper continuous seal. Curbs shall be internally insulated in an approved manner.

5. Installation of each A/C unit and roof curb shall be in accordance with wind load requirements prescribed in the International Building Code. Each curb shall be constructed and rated to meet design wind speed (V_ult) of 120 MPH, under building Exposure Category C of the IBC, and in accordance with other criteria defined in the Structural Drawings. Each curb shall include wind restraint brackets to secure each A/C unit to its curb, as well as base flange anchored to roof structure. Refer to Structural Drawings for structure and angle framing being provide for each unit on the roof.

6. Contractor and unit manufacturer shall refer to Architectural Specifications and Details for additional roof curb requirements. Each curb shall be arranged to accommodate external insulation and flashing around the perimeter as detailed.

7. Contractor shall provide wood blocking and shimming at the base of each curb, as required to maintain minimum flashing heights and insure level installation of each A/C unit.

R. All controls for control and operation of each unit shall be factory-installed, wired, tested and U.L. certified, by the air conditioning unit manufacturer. Controls shall include electronic controller, with internal sensors, wiring, etc., and shall be fully compatible with and integrated into the building DDC and energy management system to provide all control and monitoring functions, and to carry out unit sequence of operation, as described under Section 23 9000. Air conditioning unit manufacturer shall verify and coordinate control capability of unit DDC controls with building DDC and energy management system for complete interface. Unit controls shall include all interface ports and devices to accomplish integration with building EMS.

1. In addition to unit controller, each unit shall be furnished by its manufacturer any additional control termination devices required for complete DDC-EMS control of each unit. Provisions may include 24 VAC control transformer, control relays, and pre-wired terminal strip, numbered and identified, suitable for interface with external DDC system to provide complete control operation.

2. Building DDC/EMS system shall include building sensors, controller and wiring required for unit control (such as supply temperature and humidity control), as well as network interface to unit controller, to be provided by the Automatic Control Contractor. Unit controllers shall be compatible to receive DDC signals and configured to carry-out all control sequences specified.

3. Unit controller, and all other unit-mounted sensors, devices, wiring, etc., shall be factory-furnished as required for a complete operating system.

4. Unit shall be provided with phase and brown-out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage, or on phase reversal.

S. Each unit shall include U.L. listed Short Circuit Current Rating (SCCR) in accordance with NEC. Minimum SCCR rating for each unit shall be not less than 5kA at rated voltage. Factory installed fault/current protection devices shall be provided as required to establish rated SCCR.

T. Each unit shall include stamped nameplate identification affixed to the exterior cabinet. Nameplate data shall include Manufacturer, Model No., Serial No., unit volts, phase, MCA & MOCP, electric data for each component, gas heating input & pressure, and unit Short Circuit Current Rating (SCCR) in accordance with NEC.

1. SCCR identification will not be required for any unit under 60 amp FLA.

U. Units shall be as manufactured by “Aaon” Series RN, or equal, with minimum capacities as scheduled on the plans.

2.03 EQUIPMENT EFFICIENCIES

A. All HVAC equipment shall meet or exceed the minimum rated equipment efficiencies scheduled on the drawings and as prescribed under the International Energy Conservation Code.

2.04 SAFETY CONTROL FOR UNITARY EQUIPMENT

A. Each A/C unit shall be provided with duct type (or room type if indicated) smoke detectors in the return air as required by code, which shall deactivate unit and energize fire alarm upon detection of products-of-combustion. Duct detector shall be furnished by the Fire Alarm Contractor and installed by the Mechanical Contractor in compliance with NFPA 90A. Smoke detectors shall be provided as follows:

1. Each individual A/C unit greater than 2,000 cfm.

2. Each A/C unit interconnected by ducted outside air distribution systems, regardless of individual unit size.

3. Smoke detectors are not required for individual units at less than 2,000 cfm and served by individual outside air ventilation.

4. Deactivation by smoke detector of any A/C unit shall also deactivate associated central outside air HVAC unit.

B. All exhaust fans indicated to be interlocked with respective A/C units shall be arranged for continuous run operation when A/C unit is switched on, regardless of whether fan switch is in the "On" or "Auto" position.

2.05 AIR FILTERS

A. Air filters shall be provided for all A/C units and all designated filtered return air grilles, as indicated on the plans.

B. Air filters at A/C units and grilles shall be 2" thick throwaway type, with 30% efficiency pleated media and frame, MERV8 minimum, similar and equal to "FARR" 30/30, or equal. Media shall be coated with an approved dust holding adhesive and construction shall be UL Class 2. Air pressure drop (clean) shall not exceed 0.18 inches W.G. at 2.5 cfm/nominal sq.in. face area. 18 gauge minimum galvanized steel holding frames for the filter cells shall be provided, as required, to make up filter assemblies for the scheduled air cfm quantities with a maximum filter face velocity of 500 fpm.

PART 3 - INSTALLATION

3.01 EQUIPMENT

A. All heating and air conditioning equipment shall be installed in accordance with the details on the plans, and in strict conformance with the manufacturer's recommendations.

3.02 ROOM THERMOSTATS

A. Room thermostats and transmitters shall be mounted in close proximity to lighting switches, aligned directly above such switches as detailed or as otherwise directed, except not above dimmer switches on rheostats. Mounting locations shall be unobstructed by free air current, and shall be subject to final approval by the Owner and Engineer. Mounting heights of room controllers shall be as required by ADA and TAS regulations. All room sensors only, or controllers not covered by ADA and TAS, shall otherwise be mounted at 5'-0" above finished floor, unless otherwise noted.

3.03 MANUFACTURER'S START-UP SERVICE

A. At the completion of installation, complete start-up and inspection services shall be carried out for each A/C unit by a Manufacturer's Factory Representative. Representative shall be a Certified Service Technician directly employed by the unit manufacturer, and shall have thorough knowledge and experience in operation and service requirements of the installed equipment. Service shall include actual start-up operation for each unit, and verification of proper condition and installation of all unit components, refrigerant circuits and charge, motor bearings, lubrication and drives, and all unit operating and safety controls.

B. Service Technician shall set-up and configure unit controller to establish full interface with building DDC control system as required to receive and transmit all DDC control signals to carry-out all unit control functions as specified. Technician shall coordinate closely with DDC Control Contractor to achieve full interface, and shall commission all control sequences to verify proper unit operation.

C. At completion of start-up and inspection service, Service Technician shall submit written report documenting proper operating condition of all A/C units.

D. Manufacturer shall also furnish complete job-specific wiring diagrams and service bulletins for each type of A/C unit to be included in the operation and maintenance manual.

3.04 EQUIPMENT BASES

A. Provide as indicated on the plans or otherwise required, the various equipment bases. Unless noted, all floor-mounted equipment shall be furnished with a concrete base in addition to any required vibration isolation.

B. Equipment bases in general shall be reinforced concrete, having # 3 steel reinforcing bars on 12" centers both ways, located approximately halfway between the top and bottom of the base. Outside dimensions shall be such that the concrete base extends approximately 4" beyond the equipment mounting base, unless otherwise specifically shown on the plans. Base depth shall be 4", or as otherwise specified or noted. All corners shall be chamfered 1".

C. Mounting bolts shall be set in pipe sleeves, with 6" x 6" x 1/4" anchor plates, and shall be grouted-in after mounting equipment.

3.05 ROOF CURBS FOR ROOF-MOUNTED AIR CONDITIONING EQUIPMENT

A. Installation of roof-mounted equipment and roof curbs shall be in accordance with wind load requirements under the International Building Code, rated for 120 MPH wind speed, building Exposure Category C; and as detailed and noted on the Structural Drawings. Each curb shall be anchored to roof structure per Structural Drawings, and equipment shall be secured to curb with wind restraint brackets.

B. Unit and curb installation shall also be in accordance with Manufacturer's instructions.

C. Contractor shall provide wood blocking and shimming at the base of each curb, as required to maintain minimum flashing heights and insure level installation of each A/C unit.

D. The interior of each curb shall be fully insulated with thermal and acoustic batt insulation between the roof deck and unit in an approved manner.

E. Contractor shall refer to Architectural Specifications and Details for additional roof curb requirements. Each curb shall be arranged to accommodate external insulation and flashing around the perimeter as detailed.

3.06 AIR FILTERS

A. Quantity and sizes of air filters shall be selected to cover the full face area of the A/C unit filter section. Air filters shall be installed and secured in the filter frame in a manner to prevent air gaps and leaks.

B. New and replacement filters shall be furnished and installed as specified for all A/C units at each of the following points of construction.

1. Initial unit installation to protect A/C units during construction.
2. Immediately prior to final testing, balancing and commissioning.
3. Project completion and Owner occupancy.

C. All air filters provided throughout the course of the project shall be as specified for AIR FILTERS.

3.07 VIBRATION AND NOISE CONTROL

A. Transmission of perceptible vibration, structure-borne noise or objectionable air borne noise by and/or from equipment installed to occupied areas will not be permitted. The Contractor shall submit for approval data showing disturbing frequency, support weight, static deflection or natural frequency and efficiency for each isolator and damper he proposes to use.

B. All isolation material selections are to be based on laboratory published or factory certified data, proving that all such materials and usage comply with these specifications. Should any noise or vibration be objectionable to the Engineer, field instrumentation tests and measurements shall be made by the Contractor to determine the source, cause, and path of such disturbance. The Contractor shall correct any variance or non-compliance with the specification requirements in an approved manner at no additional cost to the Owner.

C. All air handling units, A/C units and fans shall be adequately isolated from the building structure. In all cases, care must be taken to insure that all connections to the unit be sufficiently resilient to allow full undamped functioning of the unit isolators. This includes electrical raceway, ducts, drain, piping, etc.

3.08 CLEANING, TESTING AND ADJUSTING

A. Transmission of perceptible vibration, structure-borne noise or objectionable air borne noise by and/or from equipment installed to occupied areas will not be permitted. The Contractor shall submit for approval data showing disturbing frequency, support weight, static deflection or natural frequency and efficiency for each isolator and damper he proposes to use.

B. It is the intent of this section of the specifications to provide for all necessary tests during construction and at completion of the job to insure tight piping and ductwork installations, and to support the Test & Balance Contractor to establish correctly balanced systems as specified under Section 23 9900. This Contractor shall perform such tests and shall do any and all work required to accomplish this end. Completion work shall not take place until after completion of all final finishes, painting and ceiling tile.

C. All strainers and filters shall be cleaned after pressure testing and system cleaning operations, and prior to final filling of systems.

D. All air conditioning units shall be protected with disposable air filters until installation and testing is complete and satisfactory. New filter units shall then be installed at each unit as specified.

E. All motors, bearings, etc., on all equipment shall be correctly oiled and/or greased with the proper lubricant before the equipment is operated, and again at the completion of the job.

F. External static pressures and water pressures specified and scheduled in connection with the various fans, air handling systems, and water systems, may vary somewhat with job conditions and actual installations, and thus may or may not match exactly the scheduled design data for the installed systems. This Contractor shall assist and support the Test & Balance Contractor to test and adjust the completed systems as necessary to produce the specified air and water flow quantities, including provisions for all necessary dampers and valves, changing of fan speeds and the furnishing of new drives and motors where required.

G. This Contractor shall operate the equipment installed by him for one (1) working day of eight (8) hours, and shall leave the equipment in perfect operating condition. During this period, he shall also instruct the Owner's representatives in the proper operation and maintenance of all equipment and systems.

H. This Contractor shall furnish the Owner with three typed sets of complete operating instructions and maintenance schedules for the installed systems as a whole. Operating instructions shall first be submitted for approval. Maintenance schedules shall include, but not be limited to, complete lubricating instructions designating all oiling and greasing points for all equipment and designating type of lubricant to be used.

I. Complete testing, adjusting and balancing services will be provided by a Test and Balance Agency under an independent TAB Subcontract with the General Contractor. The Mechanical Contractor shall coordinate and support TAB services as specified under Section 23 9900.

END OF SECTION

SECTION 23 9000

DDC ENERGY MANAGEMENT SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Divisions 23, 26, and 28 Specification Sections, apply to this Section.

1.02 GENERAL SCOPE OF WORK

A. Complete systems of DDC/EMS controls and automation shall be furnished and installed for the various systems in accordance with the plans and specifications. The systems shall be direct digital control (DDC), and shall be complete including, but not limited to, control and instrumentation equipment, automation equipment, communication equipment, and supporting electric/electronic control installation. New DDC system shall be “Reliable” controls and shall be integrated onto existing District Energy Management System. New DDC System shall be a turn-key installation, with components, system engineering, installation, programming and supervision provided by “Enviromatics” under an Automatic Control Sub-Contract..

B. Emergency Storm Shelter Control System: The Automatic Control Contractor shall furnish and install all Emergency Control Systems for the Storm Shelter as noted and detailed on the drawings and in accordance with Specification Section 23 9100 EMERGENCY STORM SHELTER CONTROL SYSTEM.

C. The Automatic Control Contractor shall carefully examine the existing conditions and limitations, and all costs which are incurred to accommodate such conditions and limitations, shall be included in his bid.

1.03 CONTROL CONTRACTOR QUALIFICATIONS

A. Automatic Control Contractor shall be licensed and certified for installation of DDC system specified, and shall be approved by the District. Each Control Contractor shall submit Request for Approval, and receive such approval by the District, prior to Bid. Control contractors shall each be prepared to demonstrate control system installations for school facilities of similar size and scope that have been in satisfactory use and service for not less than five (5) years. If requested, Contractors shall supply company history and provide a list of references to include school facility name, and contact name and phone number.

1.04 SYSTEM DESCRIPTION

A. Functions: The system in general shall be automatic, subject to various types of surveillance, routine adjustment, and/or operation as scheduled on the drawings and specified herein, as part of a building DDC Local Area Network (LAN), capable of stand-alone operation, with local control and monitoring via DDC modules. System shall also include an EMS communications network (WAN) for remote user interface from multiple PC Operator's Workstations located where directed by the Owner, for full remote control and monitoring communication of building DDC systems.

1. Building system LAN shall include one or more global control communication panels to provide full control communication with the EMS. Primary communication interface shall be through direct TCP/IP Ethernet Network.

2. System communication shall be Windows-based utilizing current versions of Microsoft Windows software. Primary communication shall also include WEB-enabled browser entry for multiple user interface, to allow internet communication access from any designated local, remote and/or off-site PC workstation, suitably protected via password for authorized use.

3. System communication shall be configured for one of the following open protocols:

   a. **BTL Certified Native Bacnet Protocol in accordance with ANSI/ASHRAE Standard 135**
   b. No other protocols will be acceptable.

B. Control Wiring: All cabling for control and data wiring, and network LAN wiring, required for interconnection of DDC controllers, sensors and thermostat assemblies, A/C units, control panels, controllers, operators, and any related devices furnished under this contract, as well as all supporting conduit, box, and devices, shall be furnished and installed by trained representatives of the Automatic Control Subcontractor. Responsibility for timely coordination with the Electrical Sub-Contractor to accommodate any special requirements of the Automatic Control Subcontractor shall be that of the Automatic Control Subcontractor, and as interpreted by the Engineer. Final routing and arrangement of all cabling shall be documented by approved control shop drawings, and reflected appropriately on as-built drawings for the building. Splicing of cables between terminal points of connection to devices or equipment is expressly prohibited.

1. Wiring shall be installed within the building envelope in walls, above ceilings, or exposed where necessary. Wiring shall be neatly bundled and supported from the structure by "J" hooks. Exterior wiring and conduit may be allowed only as approved by the Owner/Engineer.

2. All wiring shall be run in conduit where run below floor, concealed in walls or chases, or exposed. Wiring above ceilings will not require conduit but shall be plenum-rated cabling properly supported to structure.

3. Conduit and junction boxes required for control wiring in walls to room sensors will be furnished and installed by Electrical Contractor.

4. All new conduit shall be U.L. approved EMT with threaded or setscrew couplings. Any exterior conduit shall be galvanized rigid steel with threaded couplings. All exposed conduit in occupied spaces shall be painted.

5. All control wiring shall be low voltage (i.e., 24 VAC) where possible. Devices requiring 120 volts or greater may be used only as expressly approved by the Owner. All wiring and conduit installations shall be in accordance with NEC and applicable sections of Division 26 specifications.

6. Building LAN network wiring shall be twisted shielded pair, 18-gauge through 24-gauge, as suitable to DDC system being installed.

7. The communications network between buildings shall be run underground in one-inch minimum conduit. All underground conduit, labor, and accessories between buildings will be provided by the Electrical Contractor as required by the Automatic Control Contractor for installation of communications cable.

    a. Consideration may be given to alternate routing of control wiring and conduit between buildings (i.e., along covered canopies), subject to prior approval by the Owner and A/E. Use of existing underground conduit may also be considered if space is available, but shall be limited to communication conduit only and shall be subject to prior approval by the Owner and A/E.

8. Wiring shall be suitably tagged and identified as to use and function. Color of automation control wiring shall be per Owner protocol for existing systems, and shall be coordinated with General Contractor or as specified in this document.

9. Interface wiring with building Ethernet system for DDC system communication with central EMS shall be coordinated with Division 27 Subcontractor.

C. Intent: The entire control system shall comply with U.L. and C.S.A. Standards, and with the intent and requirements of the specified system, as interpreted by the Owner and the Engineer.

1.05 COORDINATION

A. Automatic Control Contractor shall be responsible for communicating to and coordinating with the other Contractors any and all supporting mechanical work, electrical work and general construction support, as required to carry-out complete installation of new DDC and EMS control systems.

1. The Mechanical Contractor (via unit manufacturer) shall furnish and install at his expense pre-wired contact connection points and/or terminals, as well as unit control transformer and relays, associated with any HVAC unit controllers required to accommodate DDC control as specified in SECTION 23 8000, as well as devices for any AHU, fan, pump, etc., applicable for control under this project, including magnetic contactors for three phase motors and relay contactors for single phase motors (and 24 VAC control transformers as required).

2. The Mechanical Contractor shall also install all field control devices furnished by Automatic Control Contractor that are integral to mechanical distribution, such as control valves, control dampers (not factory-furnished), immersion wells and couplings, etc.

3. The Electrical Contractor shall furnish and install all power wiring and all direct equipment interlock control wiring called for on the plans, and/or otherwise required. The Electrical Contractor shall provide all electrical work supporting the DDC control system, including extensions of 120 volt power circuits and outlets, as directed by the Automatic Control Contractor and/or as specified herein. The Electrical Contractor shall also furnish and install all recessed sensor boxes and control conduit required to be installed within walls and chases from room sensors and controllers throughout the building, as directed and required by the Automatic Control Contractor and/or shown on the drawings.

B. The Fire Alarm Subcontractor shall furnish to the Mechanical Contractor all duct-mounted smoke detectors indicated or required (for smoke damper operation or AHU / A/C units over 2000 cfm) for installation by the Mechanical Contractor. The Fire Alarm Subcontractor shall then connect all such smoke detectors to his particular fire alarm apparatus and/or controlled equipment item. The various contractors shall carefully coordinate smoke damper operator requirements to insure the proper voltage is provided.

C. The Automatic Control Contractor shall furnish and install under this contract all on-site Energy Management System and DDC control equipment, components, computers, modems, field panels, relay boards, temperature and humidity sensors, CO_2 and other controlling sensors, DP switches and current relays, high limit sensors, firestats, freezestats, etc., and all associated control wiring from such devices up to and connecting at HVAC unit terminal strips, and to appropriate connection points at starters or relays for all other HVAC equipment components. The Auotmatic Control Contractor shall furnish and install all associated control conduit where specified or required for outside, below floor, underground and exposed. Conduit & boxes within walls and chases for room sensors will be provided by the Electrical Contractor. The Automatic Control Contractor shall furnish and install all new damper operators (not factory-furnished), transducers, etc., and shall also furnish all control valves, control dampers (not factory-furnished), immersion wells and couplings, etc., to the Mechanical Contractor for installation.

1. All DDC controllers serving roof-mounted HVAC units shall be located inside each unit where space is available, or shall otherwise be located at exterior of each unit mounted in weathertight NEMA enclosure properly rated to suit the environment.

2. The Central DDC Control and Communications Unit shall be located in the MDF Room as approved and directed by the Owner.

3. All control hardware including DDC control and communication modules, local control and relay panels, field control devices, etc., shall otherwise be located in MDF and IDF rooms, and/or local areas approved by the Owner where loads are to be controlled. Location and coordination of proper wall space for control hardware shall be the responsibility of the Automatic Control Contractor, subject to review and approval by the Owner.

1.06 RELATED WORK SPECIFIED ELSEWHERE

A. Electrical Work
B. Heating and Air Conditioning Equipment
C. Fans
D. Piping

1.07 SUBMITTALS

A. Submit manufacturer's certified rating data, descriptive literature, catalogue cuts, shop drawings, etc., for all proposed:

1. DDC controllers, sensors, control devices and equipment
2. Control dampers and valves
3. Automation system and communication components
4. Description of software and graphic interface programs

B. Submit control product brochure to include make, model and detailed technical description of all DDC controllers, sensors, and devices proposed for the project.

C. Submit shop drawings representing complete control, LAN and interlock wiring diagrams for the DDC and control sub-systems, with complete descriptions of the sequence of operation of all systems and their effect on other equipment and systems.

D. Shop drawings shall represent building floor plans, HVAC system flow diagrams and EMS network arrangements for all DDC controllers, communication modules, PC interface, etc. Shop drawings shall be project-specific and shall include the following:

1. Distributed locations of DDC control and communication modules, and temperature and humidity sensor locations, throughout the building or site, with wiring distribution and legend of all wire color.

2. Point-by-point diagram of control circuitry for each DDC controller, as well as scheduled list of each control point per controller as to point identification address, type, function, and equipment, system and/or area served. Schedule shall be categorized by unit name and ID address of each controller, as well as ID number of HVAC unit served.

3. Complete control valve and damper schedules representing size, type, capacity, manufacturer and system served.

4. Complete descriptions of sequence of operation, with supporting system flow diagrams of all HVAC equipment and systems served, representing applicable control devices properly correlated to DDC controllers.

5. Typical representations for identical systems are acceptable, provided all applicable units are listed and identified.

1.08 CLOSE-OUT DOCUMENTS

A. Record Drawings: At the completion of the project, the Automatic Control Contractor shall submit complete Record Drawings to include all shop drawing documentation described above, including floor plan drawings, control drawings, and wiring diagrams, which shall indicate actual installation of DDC control component and device locations, network and wiring configurations, etc. This shall include documentation, software, all DDC control logic and all associated support documentation on approved media accurately representing the final installed system.

B. Operation Manuals: Submit three (3) copies of complete manufacturer's instructions and drawings for installation, maintenance and operation of all hardware components and devices, as well as complete description on the use and function of all programming and interface software.

C. Automatic Control Contractor shall submit one (1) hard set of record drawings and documents, as well as one (1) electronic copy provided on CD-ROM to be delivered to the Owner. Record drawings shall be submitted in standard program formats such as Autocad, .pdf, .doc, etc.

1.09 VERIFICATION TEST

A. The Control Contractor shall conduct a verification test of the entire control system to determine point-by-point operation of all controls, and shall perform all required continuity testing of conductors. Each control point shall be tested for proper function and operability, including correct on/off signal and/or initiation of each digital point, and the correct signal variation across complete range of each analog point in terms of temperature, humidities, pressures, flows, etc. The Control Contractor shall submit a written statement certifying that all point-to-point checks have been completed, including a list of any incomplete or inoperative devices found. Certification statement shall be submitted no later than five (5) days prior to substantial completion review.

1.10 CALIBRATION AND ADJUSTMENT

A. Temperature sensors shall be calibrated to less than or equal to a 1/4^{o}F resolution for the specific application.

B. After completion of the installation, Contractor shall perform calibration and adjustment of all sensing and control devices, and shall carry out services incidental to the proper performance of the control system.

C. Control Contractor shall document and submit detailed calibration and checkout log representing the calibration and adjustment activities performed. The documentation shall be submitted no later than five (5) days prior to substantial completion review.

1.11 GUARANTEE AND SERVICE

A. The control system herein specified shall be free from defects in workmanship and material under normal use and service. If within two (2) years from date of acceptance by the Owner, any of the equipment described herein is found to be defective in workmanship or material, it shall be repaired free of charge. Warranty shall cover all costs of parts, labor, travel, software modifications, and other applicable expenses throughout the warranty period.

B. All control hardware (controllers) shall also have an extended product warranty of an additional three (3) years.

C. In addition, the Control Contractor shall, after completion of the original tests of installation, instruction of the Owner's personnel, and acceptance by the Owner, provide any service incidental to the proper performance of the control system for a period of two (2) years free of any additional cost to the Owner.

D. In the event of disagreement as to Control Contractor liability above, the decision of the Owner and the Engineer shall be final.

PART 2 - PRODUCTS

2.01 GENERAL

A. It is the intention of this portion of the specifications to set a minimum standard of quality for all equipment and devices used in the control system and at the various control panels or modules. Any reference to a single equipment item, control system, panel or module shall be construed to apply equally to all similar items, systems or panels as may be applicable in the opinion of the Owner. All hardware employed within this system shall be of the "first quality" grade, and subject to approval. Equipment shall be selected on the basis of durability, serviceability, and function.

B. Temperature Control and Automation equipment shall be standard catalogue products as manufactured by the Automatic Control Subcontractor, and the equipment furnished under this section of the specifications shall be supplied as a complete system, utilizing all of the various components specified to meet the functions and accuracy described within this section of the specifications.

C. Generally, automatic control devices shall be low voltage (less than 120 volts) as product availability and application permit. Devices operating at or controlling voltages of 120 volts or more, other than firestats, freezestats, and smoke detectors, may be used only as specifically approved by the Owner.

D. The most recent versions of all operating software, control software, and graphics generation software shall be provided, along with required usage licenses. Quantity of user licenses shall be as directed by the Owner. All software shall be provided for the Owner to make any changes without Control Contractor support. (i.e., if the Owner needs to change a graphic, provide the graphic software that generated the original.)

2.02 AUTOMATION EQUIPMENT AND SYSTEM OVERVIEW

A. All control functions (specified herein and scheduled on the drawings) shall be carried out by the building DDC system interconnected on a hard-wire LAN communications network. System shall also be arranged for full and direct communication with the District-Wide Ethernet communications network for EMS interface with remote Operator’s Workstation(s).

B. System Overview:

1. The system shall consist of a building-wide communications network (LAN) for each building that interconnects field hardware (DDC controllers) with a central building DDC/EMS network manager. The central network manager shall be configured to communicate via direct Ethernet network, with the new building Operator's Workstation as well as the Owner's existing remote Workstation(s), and with other designated PC workstations and/or portable laptop PC's. The field hardware shall be individual unit DDC modules located where directed at HVAC units, in mechanical spaces, janitor or storage rooms, and/or local areas where loads are to be controlled, each uniquely designed to operate and control the assigned loads on a stand-alone basis.

    a. Primary Ethernet communication shall be configured to communicate over the Owner's WAN (via TCP/IP) and shall be Windows-based and enabled for WEB-Browser interface to allow password protected internet access from any designated PC workstation for all control and monitoring functions.

2. Each module shall be capable of performing all specified functions in a completely independent manner; i.e., individual control programs shall reside in the module designated to control a specific piece of equipment. The central network manager shall be able to communicate throughout the building automation network without requiring a PC or remote modem device.

3. DDC modules shall be interconnected by twisted shielded pair, 18-gauge through 24-gauge as applicable, with each module on a peer-to-peer network configuration having equal authority to send and receive information on the LAN.

4. Building DDC system shall be capable of future expansion via "building block" approach. System shall be capable of incorporating additional control schemes beyond HVAC system control, such as irrigation system control, lighting control, etc.

5. It shall be the responsibility of the Automatic Control Contractor to provide all network communication wiring, termination devices, routers, etc., and to make proper connections for both Ethernet interface. Contractor shall obtain Ethernet I/P addresses made available for use with the DDC system, as designated by the Owner. All terminus locations, routing of network wiring, color code and cabling identification, etc., shall be subject to direction and approval by the Owner.

C. System configuration and Communication Protocol: New DDC and Energy Management System shall include BACnet MS/TP technology at the controller level and Niagara Framework AX version technology at the network device level and as the network management tool. The DDC/EMS shall consist of Direct Digital Control (DDC) controllers, Building Controllers (BC), Graphical User Interface through standard Web browsers, sensors, relays, valves, actuators, and other equipment as may be necessary to provide for a complete and operational control system for the HVAC and other building related systems as described within these specifications.

1. The system installed shall seamlessly connect devices other than HVAC throughout the building regardless of subsystem type, i.e. HVAC, lighting, and security devices shall easily coexist on the same network channel without the need for gateways. BACnet MS/TP components not supplied by the primary manufacturer shall be integrated to share common software for network communications, time scheduling, alarm handling, and history logging.

2. The documentation contained in this section and other contract documents pertaining to DDC control of HVAC and other specified systems is schematic in nature. The Contractor shall provide hardware and software necessary to implement the functions shown or as implied in the contract documents.

3. System configuration and monitoring shall be performed via a PC-type computer. Under no circumstances shall the PC be used as a control device for the network. It can be used for storage of data.

4. All DDC equipment and system controllers shall be provided by one manufacturer. BACnet MS/TP components not supplied by the primary manufacturer shall be integrated to share common software for network communications, time scheduling, alarm handling, and history logging.

D. Open Systems Design: It is the Owner's express goal to implement an open Building Automaton System that will allow products from various suppliers to be integrated into a unified system in order to provide flexibility for expansion, maintenance, and service of the system. The BAS provided shall maintain open interoperability in the following areas.

1. Communications - The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate ANSI/ASHRAE Standard 135-2001 BACnet MS/TP, LONWORKS technology, MODBUS, OPC, and other open and proprietary communication protocols in one open, interoperable system.

2. Network Management - Network management tools shall be based upon Niagara Framework technology as developed by the Tridium Corporation. All tools and hardware provided shall comply with the current release version of the AX Niagara Framework platform. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135- 2004, BACnet MS/TP and LONMARK to assure interoperability between all system components is required.

3. User Access - The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.

4. Databases - All controller program graphics and network databases shall be provided in a Niagara Framework AX format. The database shall be stored on the owner PC and provide on a separate CD upon final acceptance of the project. An updated database shall be provided on a CD at the end of the warranty period.

5. Network Level Devices - All network level devices (devices that provide for communication interface between the BACnet and the Ethernet) shall conform to the current released version AX of the Niagara Framework.

6. Field Level Controls - All field level controls shall be certified to the current BTL standards appropriate to their application so long as an appropriate BTL Certification standard exist. All points within a controller including hard I/O and software based points such as (constants, variables, NVI, NVO, SCPT, UCPT, SNVT, UNVT) shall be available for viewing and manipulation through any BACnet MS/TP based network device management or Graphical User Interface (PC based or Browser) tool. Any products that use explicit messaging shall not be acceptable.

7. Software Tools - All software tools needed for full functional use, including programming of controllers, network management and expansion, and graphical user interface use and development, of the BAS described within these specifications shall be provided to the Owner or his designated agent. Any licensing required by the manufacturer now and into the future, including changes to the licensee of the software tools and the addition of hardware corresponding to the licenses, to allow for a complete and operational system for both normal day to day operation and servicing shall be provided. Any such changes to the designated license holders shall be made by the manufacturer upon written request by the owner or his agent. Any cost associated with the license changes shall be identified within the DDC submittals.

E. All new and existing hardware, control equipment, I/O lead-in conductors, routers, etc. shall be appropriate for a fully compatible interface capability, including any conversion of voltages, signal types, etc. as may be required.

F. Such additional interface components, memory modules, power supplies, etc. as may be necessary to achieve availability for effective interface shall be provided. All new interface terminals shall be appropriately numbered and identified.

2.03 EMS CONTROL AND INTERFACE SOFTWARE

A. GENERAL REQUIREMENTS:

1. Automatic Control Contractor shall configure all control, programming and graphical user interface software for efficient and effective control, monitoring and operation of all HVAC and other controlled equipment and systems through the building DDC system, via Owner’s designated PC operator workstations.

2. Primary Ethernet communication shall be arranged for Internet Web-based operations, with password protected interface from any designated workstation and laptop PC. System shall have the capability of operating on a multitude of platforms, including Microsoft Windows via Internet Explorer or Firefox.

3. Software shall be menu-driven under windowing format, with intuitive and user-friendly control applications at all levels including:

   a. Network configuration
   b. Graphics development and data summary tables
   c. Data displays and control point management
   d. Control programming and development of control sequences
   e. Scheduling tools
   f. Alarm monitoring and routing

g. Trending, logging and reports
h. Data transfer and storage

4. System shall allow the operator to perform the following functions, under proper password protection:

   a. Adjust, change and modify control settings, setpoints and data points.
   b. Establish, modify equipment operating schedules.
   c. Create, modify, and download control sequences and functions.
   d. Add/delete objects to the system.
   e. Tune control loops through the adjustment of control loop parameters.
   f. Enable or disable systems.
   g. Generate text file reports.
   h. Select points to be alarmed and define alarm state.
   i. Select points to be trended over user-defined time periods.

5. All system functions shall be programmed for execution from the remote Operator's Workstation through a "point and click/drag" graphical user interface (such as mouse) that allows for setpoint/control changes, scheduling, movement through menus and links, graphics development, etc., without the need for text entry.

6. All system information shall be displayed at the operator's command in dynamic color graphics for instant communication of specific or system-wide conditions at any given time.

7. Access to the system shall be through an assigned name and password, with unlimited number of password protection assignments for authorized use of web-based access to the control system, and with definable restrictions to all levels of control applications and data points. The system supervisor shall be able to set passwords and security levels for all other operators. Each operator password shall be able to restrict operator's access for viewing and/or changing each system application, graphic and screen editor, and individual point.

8. Capability shall be provided to automatically download information to, and to receive information from, individual control modules from the PC workstation.

9. The operator of this system shall be able to request information and make changes at each graphic level for the equipment shown at that specific level or below.

10. Programming, scheduling and setpoint changes shall be accessible for modification on each menu for the associated equipment. Operator shall be able to automatically download changes from the central site to the appropriate program in the respective DDC module for the equipment being controlled.

11. System shall have the capability of communicating global or individual adjustment of all system control parameters (scheduling, setpoint changes, etc.) from the PC workstation to any definable grouping of building DDC modules.

12. System software shall be multi-tasking to allow operator to switch from energy management mode to wordprocessing, spreadsheet, or other operating mode.

13. Graphics and data displays shall be easily transferrable between other software programs. System shall be able to generate, send and receive graphics, files, photos, etc., under multiple file formats including PDF, JPEG, DOC, XLS, DWG, BMP, GIF, etc.

    a. Graphical drawings such as building floor plans and equipment and system diagrams shall be able to be imported and exported to Autocad or Bitmap drawing files for internal or external use. Data summary tables, trends and logs, charts, graphs and reports, shall be transferrable to spreadsheet and wordprocessing programs such as MS Excel and MS Word.

    b. File management shall include files, folders and directories under standard Windows format.

14. Operator shall be able to define fail-on/fail-off capability for each individual point.

15. Online Help: Software shall include a context-sensitive online help system to assist the operator in operation and editing of the system. Online help shall be available for all applications and shall provide relevant data for each particular screen.

16. System Diagnostics: System shall automatically monitor the operating integrity of the DDC system including DDC controllers, network connections, sensing devices, I/O points, etc. Alarm failure of any component shall be enunciated to the operator.

17. Reports and Logs: Software shall include a reporting package that allows the operator to select, modify, or create reports. Each report shall be definable as to data content, format, interval, and date. Report data shall be archived on the hard disk for historical reporting. Report routines may include time logs for any designated list of objects. Reports and logs shall be stored on the PC hard disk in a format that is readily accessible by other standard software applications including spreadsheets and wordprocessing, and may also be readily printed to the system printer.

B. GRAPHICAL USER INTERFACE:

1. Graphics software shall be included to generate and use dynamic color graphic displays of building and systems being controlled. User shall be able to easily generate, modify, add and delete graphic displays customized to meet District interface standards as directed by the Owner.

2. Color Graphic Displays under Windows-based format shall be created generally as follows: District Map and Individual Site Plan Layouts with building penetration icons, as well as building floor plan displays showing all HVAC zones throughout each building. Icon links on the floor plans will allow penetration to the building mechanical equipment. Provide system graphics for each piece of mechanical equipment, including air conditioning units, heat pump units, air handling units, fans, geothermal loops, and chilled and heating water systems as applicable, with dispersed dynamic data. Points required by the sequence of operations shall also be displayed to optimize system performance analysis and speed alarm recognition.

a. The floor plan graphics shall include HVAC unit number, name and number of room or zone served, temperature sensor and controller locations, and shall provide a visual dynamic display of unit status, room temperatures and humidities, and other building sensor values, all relative to their respective setpoints. Floor plan shall also show dynamic status of each lighting zone served.

b. Mechanical equipment and system diagrams shall show the type of mechanical system components serving that particular zone. Each diagram shall display dynamic color status reading of each piece of equipment and analog readouts in appropriate engineering units and location on graphic representation.

3. Graphics package shall include all editing tools for graphic development including clipart library with extensive inventory of animated and non-animated equipment, symbols, icons, etc. Library shall allow user to add custom symbols.

4. System displays shall also include scheduling tools and tabulated summary data of each system directly linked to each applicable floor plan and system graphic display in accordance with existing interface standards used by the Owner. Tabulated data for each system and/or globally for all systems shall include operation scheduling, setpoint adjustment, point monitoring, etc.; formatted per District Standards as directed by the Owner. Operational scheduling of all equipment shall be displayed and utilized on a calendar-based configuration.

5. System graphics page shall provide means to set temperature/humidity setpoints, CO_2 and vent control settings, operating schedules, control functions, high and low limits, deadbands, control loops, etc., for each system.

6. All graphics shall include dynamic display of all status points scheduled on the drawings and otherwise provided to carry out all sequence of operations.

7. Graphics data displays shall include global, zone or individual data monitoring and commands, configured for the following levels: District-Wide, Building-Wide, Building Zones, Individual System or Equipment. Global commands per Window display for each level may include common occupied temperature setpoints, setback setpoints, operating schedules, optimized start/stop, etc., and shall be configured as selected and directed by the Owner.

8. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection or text-based command.

9. Dynamic temperature values, humidity values, flow values and status indication shall be shown in their actual respective locations and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh rates.

10. Equipment state can be changed by clicking on the point block or graphic symbol and selecting the new state (on/off) or set point.

11. The following information shall be selectable via menu format available for each graphic:

    Alarms
    Messages
    Schedules
    Trends
    Setpoints and control parameters
    Equipment status
    Sensor values (temperature, humidity, etc.)
    Programming parameters

12. Binary and analog point data displays presented at each graphic shall be identified in proper engineering units and user-defined digit links. Data characters and backgrounds may be assigned user-defined dynamic colors indicating state of data. Data displays may also be assigned links to new user-defined displays.

13. The windowing environment of the PC operator workstation shall allow the users to simultaneously view several applications at a time to analyze total building operation or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.

C. USER PROGRAMMING SOFTWARE:

1. System shall include programmable software to allow the user to create and modify customized algorithms and control functions. Programming format shall utilize either object-oriented logic diagram, or BASIC language text data technologies. Programming shall be user-friendly in English language code.

2. Custom programming applications shall include elements for mathematical, logical, timing, setpoint, display, and input/output functions to create user-defined control functions. Programming applications shall include simulation tools to verify and debug control routines. All applications shall be downloaded and executed at any selected DDC controllers.

3. Program applications shall allow easy duplication for multiple controllers and control systems.

D. SCHEDULING:

1. Automatic operating schedules shall be provided for all controlled equipment and systems through associated DDC controllers. The system shall be able to provide unlimited calendar-based scheduling capability and the operator shall have not less than three selectable categories of schedules from which to choose: Normal Occupancy (weekly), Holiday and Special Event.

2. Normal operating hours, holiday hours and multiple self terminating special events can be programmed for advanced scheduling many years in advance, with operator schedule changing and clearing capability at any time.

3. Each user-defined schedule shall be programmed in a graphical manner. A minimum of twelve (12) independent operating schedules shall be set-up and available for each building.

4. The operator must have the ability to communicate schedules at the most efficient level, ranging from system-wide to the module-specific level.

   EXAMPLE: If the schedule is campus-wide (or complex-wide), it is communicated once at the campus level and automatically communicated to all control modules throughout the system. If the schedule affects only one floor of one building or building module, the schedule must be entered only once at the floor level and automatically communicated to all control modules for that floor. If the schedule impacts only one piece of equipment, it must be communicated directly to the module responsible for the control of that equipment. The operator shall also have the capability of selected, multiple unit scheduling.

5. The system must allow the operator to designate any combination of control points to form a group that can be scheduled for special events through one command at the PC workstation.

6. The operator shall be able to download any or all schedule changes to the control modules at his discretion.

7. The operator shall be able to view a color-coded, weekly forecast of schedules for instant overview of facilities operation.

8. Each module shall have the capability to execute the following scheduling procedures:

   a. Start/stop by time of specific day of week
   b. Start/stop by time daily
   c. Start/stop by time and date
   d. Self-deleting schedules
   e. Unlimited dating of schedules
   f. Holiday override scheduling
   g. Special event scheduling
   h. Unlimited schedules capacity (start/stops and days they apply).

E. ALARM NOTIFICATION AND MANAGEMENT:

1. Alarms and messages shall be operator-defined and the operator shall determine if the alarm or message is to be based on temperature limit, humidity limit, status, or off normal reporting. There shall be unlimited length for text generated to report alarm or message. At minimum alarm notification shall include date and time, location (building, room number), unit number, time and date of acknowledgement with user identification.

2. The system shall be capable of setting up multiple points simultaneous to deliver an alarm or message from each building. The system shall also be capable of alarm delivery to PC workstation screen, as well as printer, email, and phone as determined by the Owner.

3. Alarm management shall include user-defined acknowledgement, storage and routing. Alarm generation shall offer definable annunciation categories, timed routing of alarms, and runtime and/or event counts for equipment maintenance.

4. Alarm notification shall be set-up for status failure or off-normal condition of all controlled equipment and systems, off-normal conditions of sensing devices, applicable input/output points, as well as DDC controller, point and network failures.

5. Alarm annunciation may also be displayed graphically, with dynamic color animation for normal, alarm, and alarm acknowledged states for both analog and binary data points, and shall include capability for alarm blink or flash of objects and text data. The user shall define the foreground and background colors for each state.

6. The system shall be provided with a dedicated alarm window or console at the operator's workstation. Alarm notification via popup window shall notify operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. Alarm notification window shall supersede all other windows on the desktop. The PC shall be multitasking for receipt of alarms or messages while in non-energy management functional mode.

7. Accumulated alarm data shall be able to be delivered for indefinite storage on hard disk.

F. APPLICATION CAPABILITIES:

1. Night Setback Control: During unoccupied mode, this system shall be able to automatically cycle the HVAC systems for heating and for cooling to maintain respective setback and setup temperature setpoints (adjustable) as sensed by room sensors in each area served. During setback/setup operation, ventilation dampers shall remain closed and associated ventilation fans shall remain deactivated.

2. Morning Warm-Up/Cool-Down: When switched to normal occupied mode, system shall engage warm-up/cool-down operation. Ventilation damper shall remain closed and associated ventilation fan will remain deactivated until space temperature reaches occupied setpoint. Damper shall then open to minimum scheduled position, and associated vent fan shall energize, for normal occupied mode.

3. PID Temperature Control: The operator shall be able to custom design the PID control algorithm to meet the requirements of the equipment being operated.

4. Optimized Start/Stop Control: System shall be started and stopped automatically under optimized control:

   a. Optimal Start: System activated so that occupied setpoint is reached just as space becomes occupied. Start time determined based on historical warm-up/cool-down rate of up to five previous days, applied to current indoor and outdoor temperature differences. Ventilation dampers shall remain closed and associated ventilation fans shall remain deactivated until start sequence is completed.

b. Optimal Stop: System deactivated so that building will maintain temperature by “fly wheeling” up to upper setpoint limit (adjustable). Stop time shall be determined by similar control algorithm as optimal start configured for deactivation.

c. DDC shall include operator enable/disable switch on global building graphic display for optimized start/stop control. Disable mode shall return to standard operating schedules.

5. Demand Limiting: Fully adjustable system demand limiting on startup and/or peak time of day periods.

6. Heating/Cooling Sequencing: Operator capability of preventing simultaneous heating and cooling operation for each system. Also, operator capability of separate setpoint adjustment for each stage of heating and/or cooling, with fully adjustable dead-band ranges.

7. Supply Air/Water Reset: Application shall be capable of automatically resetting supply water and/or air temperature based on variable heating/cooling loads, variation from setpoints and/or outside air temperature.

8. Self-Learning start/Stop time Optimization: The warm-up/cool-down cycle shall be self-learning and shall include independent lead-time variables for the warm-up/cool-down of a heat/cool source; e.g., boiler or chiller.

9. Run Time: The system shall provide accumulated operating run time information (as opposed to "enable" time) for designated output and input point on command from operator.

a. Data shall be retained in non-volatile module memory.

b. Each module shall be capable of delivering all accumulated data to the PC workstation with capability of transferring trend data to outside spreadsheet applications such as MS Excel, or for permanent storage on hard disk.

10. Energy Monitoring: System shall include kW/kWh monitoring of the building electrical service. Monitoring signal shall be tied to the electric service meter(s). Contractor shall coordinate with the service company for tie-in to monitoring point at meter. If such is not available, Contractor shall otherwise provide amperage meter at main feeder. Monitoring signals shall be provided for all electric meters serving each building.

11. Trend Logging:

a. The system shall be able to generate trend logging for fully graphic reporting and overlay capability for all analog inputs and internal variables.

b. The system shall be able to simultaneously trend multiple points selected by user for generation of graphic comparisons.

c. The system shall allow the user to create trend and X-Y plots windowed to any graphic displays using simple commands. Preconfigured trends or plots shall facilitate operator to call-up trend log displays without any additional programming.

d. Each module shall be capable of delivering all accumulated data to the PC workstation for permanent storage on hard disk.

12. Data Collection and Storage Requirements: The PC workstation shall have the ability to collect data for any property of any object and store this data for future use. Data collection from DDC controllers and workstation shall be configured as follows:

a. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.

b. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.

c. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.

d. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

e. All log data shall be stored in a relational database in the PC and the data shall be accessed from a server (if the system is so configured) or a standard Web Browser.

f. The PC shall have the ability to archive its log data either locally (to itself), or remotely to a PC server.

g. Provide the ability to configure the following archiving properties, at a minimum:

1) Archive on time of day.
2) Archive on user-defined number of data stores in the log (buffer size).
3) Archive when log has reached its user-defined capacity of data stores.
4) Provide ability to clear logs once archived.

13. Database Backup and Storage: The database shall be backed up based on a user-defined time interval. The software shall have the ability to automatically complete full or partial backups; and have the ability to full or partial restore. Partial is defined as only items that have changed in the database. Copies of the current database and, at the most recently saved database shall be stored in the PC workstation. The age of the most recently saved database is dependent on the user-defined database save interval.

G. CONTRACTOR REQUIREMENTS FOR EMS INTERFACE:

1. Contractor shall develop all graphic display pages as specified to meet District Standards, under supervision and approval by the Owner.

2. Contractor shall also establish all initial operating schedules, setpoints and control parameters, and data monitoring points as scheduled on the drawings and specified for all control sequences, using data furnished by and as directed by the Owner. System setup requirements shall be established for all controlled equipment and systems, and shall include:

   a. Password entry formats
   b. Standard, holiday and event operating schedules
   c. Setpoints and control parameter settings
   d. Unit status points
   e. Analog data points for temperatures, humidities, etc.
   f. Alarm notification
   g. Standard trend logs

3. System setup and configuration shall result in fully functioning operator interface for all specified control and monitoring functions of the building DDC system.

2.04 LOCAL AREA NETWORK

A. The building DDC local area network(s) (LAN) shall provide a hard-wired peer-to-peer network, for a complete standalone, distributed control system in each building. All DDC controllers shall communicate over the local area network consisting of twisted shielded pair cabling, 18-gauge through 24-gauge depending on manufactured system.

B. Building LAN and/or Sub-LANS shall be high-speed “bus type” network over which information is transmitted in a global manner between all controllers on the network.

C. Building LAN shall be integrated into a central building control and communications module tied to the District Ethernet Network to provide remote EMS control and monitoring communication with any and all DDC controllers. System shall also include communication ports for direct connection of laptop PC’s and POT’s to provide full operator control and monitoring communication over the entire building LAN.

D. Wiring connections between sensors and controllers shall include jack type plug-in connections to the extent available by the manufacturer.

E. Packaged data transmission shall be employed to allow dozens of data signals to be transmitted simultaneously. Transmission speed of the building LAN shall be not less than 76.6 kB, with transmitted signals to be received at any controller and workstation at not less than 3 seconds.

2.05 CENTRAL BUILDING DDC NETWORK COMMUNICATION CONTROLLER

A. Central building controller provided for each building shall be a microprocessor-based DDC control module and shall include communication hardware and graphical user interface software to effect interface of all building DDC control and communication data throughout the building LAN, with the remote PC operator’s workstation and designated PC workstations over the District Ethernet Network (WAN) for EMS interface.

B. Central controller shall contain programmable non-volatile memory with complete operating system and control programs. Controller shall be fully programmable to allow for receipt, storage, transmission and execution of user-defined control functions, control parameters settings and setpoints, monitoring data, operating schedules, trend logs, etc. Control processor features and input/output provisions shall be similar to DDC controller specifications.

C. Central controller shall be dedicated to monitoring the communication integrity of all DDC modules on the network, and to provide access for the network to communicate with each remote site.

D. Central controller shall include integrated router and service modem hardware for direct communication interface with District-Wide Ethernet Communications Network, as the primary means of EMS interface.

E. Ethernet communication speed shall be at least 100 MB/S. Communication interface shall be fully internet TCP/IP compliant, compatible with District Network.

F. Communication software in conjunction with the AC resident Ethernet card shall operate on all industry standard physical media, and include Thinnet, Signet and Fiber Optic network topologies. Network interface and dedicated Ethernet ports shall support multiple cabling types such as 10base100 or fiber optics.

G. Control Contractor shall provide interface wiring connection to District Ethernet Network, and shall obtain IP addresses and access for control communication to be assigned and made available by the Owner. Contractor shall submit access application forms as directed.

H. Additional communication hardware shall be provided with dedicated communication ports to include RS-232, as well as multiple RS-485/422 and USB ports, as available. Controller shall be configured for direct interface connection with portable laptop PC to provide direct LAN communication for full operator control and monitoring functions including scheduling, setpoints and programming, unit status and sensor monitoring, alarm interrogation, trending, etc., for all controlled equipment and systems through associated DDC controllers throughout the building LAN. Such interface and communication shall be fully functional directly on the LAN without the need for web-enabled internet access through the District Ethernet Network.

I. Central controller shall include clock and battery backup, with automatic synchronization of respective clocks at all other DDC controllers throughout the LAN.

J. Central controller and all DDC controllers shall support open communication protocols, including LONWORKS technology or ASHRAE Bacnet as specified, compatible with IEEE 802.2 or 802.3 Standards. LON controllers shall include neuron microprocessors, echelon transceiver chips, network service pins, etc. as required.

K. Panel enclosures for central controller shall be locking-type, metal cabinet, with common keying. Enclosure shall have metal print pocket suitable for storing wiring, service and log information. Each enclosure shall be NEMA type with gaskets, rated to suit application environment. Each controller shall be capable of operating over a temperature range of 20-150^{o}F, and humidity range of 0-95% non-condensing.

2.06 DDC CONTROLLERS

A. System shall consist of individual microprocessor-based DDC control modules (application-specific controllers, unit controllers, system controllers), as required to provide control and monitoring functions of all controlled equipment and systems as specified for this project.

B. Each control module shall be capable of stand-alone operation utilizing its own processor, memory, resident operating system and control programs, input/output, A to D conversion, clock and battery backup as available, and voltage transient protection devices.

C. Each module shall contain programmable nonvolatile memory so that a loss of power does not result in a memory loss.

D. All controllers shall be programmable, able to receive and retain in memory customized control applications developed and downloaded through the EMS and building LAN, to be resident and executed at each controller.

E. Application-specific controllers shall be limited to unitary and terminal applications only (small packaged AHU, fan & coil, package rooftop A/C, unitary split-system A/C, VAV terminal). Where resident control functions, I/O point capacity, etc., be unable to fully meet all specified control and monitoring functions and sequences of operation (multi-stage control, variable modulated control, various ventilation control schemes, etc.), higher-level unit controllers shall be used.

F. Each controller shall include a resident default weekly operating schedule that can be automatically executed whenever building LAN communication is lost, with default scheduling parameters defined by the operator. At a minimum, application-specific controllers shall be set to default to normal occupied unit operation.

G. Each controller shall include RS-485 communication port or similar means for direct interface connection with portable laptop PC, to allow local operator control and monitoring functions including reset operating schedules, adjust setpoints and control parameters, monitor sensor and/or status conditions, interrogate and troubleshoot alarm conditions, trend data points, etc. Connection to any individual controller shall support such interface communication without the need for web-enabled internet access through the District Ethernet Network.

H. Each module shall incorporate on-site maintenance and diagnostic software and diagnostic indicator lights.

I. To share global building data, modules shall be able to communicate with each other at not less than 76.6 MB/S over a local area network (LAN).

J. There shall be no network configuration requirements such as star, bus (multidrop), ring, etc., and each LAN shall be expandable without disruption to existing module functionability.

K. Each module shall have automatic restart with sequencing after power failure.

L. Each module shall be capable of analog input sensing using the industry standard of 4 to 20 mA, 0-5 or 0-10 VDC, etc., as required.

M. Operator shall be able to define fail-on/fail-off capability for each individual point (not required for loss of power).

N. Temperature sensing devices shall have an end-to-end accuracy of +/-1°F or +/-2% relative humidity, and shall be compatible with 4 to 20 mA, 0-5 or 0-10 VDC, etc., industry standard.

O. Input/Output (I/O) Interface

1. To gather sensor data and interface with controlled equipment, DDC control modules shall include and utilize I/O point terminations suitable for the application. This design shall allow different types of points using any of the following input/output options:

   a. Input Options (universal; analog or digital) - monitor the open/closed status of dry contacts, monitor analog values of voltages, current and resistance from temperature, pressure, relative humidity, CO_2 sensors, etc.

   b. Digital Outputs Options - control on/off, start/stop relays.

   c. Analog Output Options - supply voltage or current outputs to controllers.

2. Universal inputs (UI)

   a. Unitary Controller shall accept isolated contact closures (either normally open or normally closed contacts).

   b. Unitary Controller shall accept analog inputs (voltage, current, and resistance).

   c. Analog inputs can be linear or non-linear. Points shall include an A/D converter and an analog power supply. All points shall be wired to the UC using #18 AWG twisted, shielded pair cables (Belden 8760 or equivalent) or larger or as recommended by the Control Contractor.

3. Digital outputs (DO)

   a. The digital outputs shall control on/off, start/stop relays which have low voltage coils. Dry contact or triac outputs are acceptable. Common ground outputs are acceptable.

   b. Relay outputs rated at 24v – 10 amps, Class 2 only.

   c. Relay driver circuit prevents electrical spikes or surges from relay coils.

   d. Green power indicator shows presence of control power.

   e. Manual Output Signal feedback available.

4. Analog outputs (AO)- The analog output supplies voltage or current to the control devices (i.e. damper actuator). All output points to valves and dampers shall read as a percent open. Signal types shall include 4-20 mA (into 1,000 Ohm load), resistance (up to 1,000 Ohms), and voltage (0-10 VDC).

P. Panel enclosure for each controller shall be NEMA type with gaskets and screwed cover, rated to suit application environment. Each controller shall be capable of operating over a temperature range of 20-150^{o}F, and humidity range of 0-95% non-condensing.

Q. All controllers shall be clearly identified by labels, and shall be strategically located in specified areas of the building that are easily accessible for maintenance and repair.

2.07 FIELD CONTROL DEVICES

A. Control damper operators shall be provided for all control dampers indicated and specified (not factory furnished). Operators shall be fully modulating type (multizone unit zone dampers, VAV dampers, economizer or CO_2 dampers), or shall be two-position (minimum outside air dampers), as specified to suit the application. Operators shall be “Belimo” electric operator motors, spring-return as applicable, with five-year manufacturer’s warranty. Damper operators shall be compatible with industry standard control signals, including 4-20 ma, Tri-State digital, 0-5 or 0-10 VDC.

1. Operators shall be furnished and installed by the Automatic Control Contractor for all new rooftop A/C units, as required to ensure damper control compatibility with the DDC system. Contractor shall coordinate with the unit manufacturer. See Specification Section 23 8000.

B. Temperature and Humidity Transmitters (Sensors): Sensors for operating control or monitoring shall be solid-state electronic RTD or thermistor type suitable for DDC operation, unless otherwise noted. Sensors shall transmit a linear signal over the complete span and shall be designed for wall, duct, air light troffer, or well mounting.

1. Wall mounted Room Sensors:

   a. Room temperature sensor shall be wall-mounted Smart Sensor design having setpoint adjust, push button override, and Multi-function and configurable LCD display. Setpoint ranges and override periods shall be Operator defined through the DDC.
   b. Humidity and Co2 sensors shall be provided where shown or required for unit control. Devices shall be wall-mounted combination Temperature/Humidity/Co2 sensor unit, having ±2% accuracy on the RH sensor and built in self calibrating algorithm for the Co2 sensor with a 5 year warranty.
   c. Each sensor shall include cover and mounting box with insulated backplate behind the sensing element.
   d. Each sensor assembly shall be labeled with room number and HVAC unit number. Numbering sequence shall be as indicated on the construction drawings.

2. Duct-mounted transmitters shall have elements of sufficient length supported and mounted in a fashion that assures sensing of average temperature throughout the cross-sectional area of the air stream in which they are located.

3. All transmitters that are used in liquid streams shall be furnished with insertion wells of 2.5" minimum length to provide good temperature measurement with minimum lag and adequate protection against system forces.

4. Outside air sensors shall include watertight inlet fittings, and shall be shielded from direct rays of the sun. Temperature transmitters shall have a linear output of 1.1 ohms per degree F throughout the total span, and shall have end-to-end accuracy of no more than +/- 1°F. Temperature range shall be suitable for the application, up to -40 - 250°F.

5. Humidity transmitter shall have end-to-end accuracy of no more than +/-2% RH at 75°F from 20-90% RH. Transmitters shall be compatible for 4-20 ma or 1-5 VDC linear signal range, proportional to 5-95% RH.

C. Temperature Indication Sensing Element: All room, air duct, water pipe, and outside air temperature sensing elements for temperatures to be remotely indicated and/or recorded (except as otherwise noted) shall be of the resistance element, thermocouple, or solid state time pulse generator type. Thermocouples and extension wire shall be copper-constantan, 16 gauge polyvinyl over polyvinyl, "premium" grade (+-3/4°F). Resistance elements or pulse generators and their respective transmission wires shall be of comparable grade, accuracy, and reliability.

D. Static Pressure Sensors: Static pressure sensors shall be differential type with "high" output sensing duct pressure, and "low" input sensing atmospheric pressure. Sensor range shall be match static pressure of system served under the following range categories: 0-.5", 0-2", 0-5", 0-10". Sensor shall have accuracy of no more than +/-2% over the full range.

E. CO_2 Sensors: Provide carbon dioxide gas sensor/transmitter as indicated in the plans and specifications. Co2 sensor shall be integrated onto room temperature/humidity console as specified.

1. CO_2 sensors shall meet the following specifications:

Measurement Range:	0-5000 PPM (software adjustable to 9999 PPM)
Accuracy:	+/-5% of reading or 100 PPM, whichever is greater
Response Time:	Less than one (1) minute
Output Signal:	4-20 ma linear
Output Impedance:	1000 ohms
Repeatability:	+/- 20 PPM
Drift:	+/-100 PPM per year
Calibration Adjustments:	Offset and span (adjustable)
Sensor Operating Principal:	Absorption infrared (non-disperse)

2. Minimum Required Characteristics:

Calibration Interval:	One (1) year
Operating Temperature Range:	32°F to 122°F
Operating Humidity Range:	5-95% RH non-condensing
Power Requirement:	16-24 VAC, 60 Hz, 16-30 VDC
Current Requirement:	50 ma peak
Operating Electrical Environment:	Floating or Grounded
Unit Enclosure Material:	U.L. Fire Rated
Operator Display:	LCD readout required in duct units; no display required for room mounted units

3. Ancillary Devices: Provide mounting bases and/or aspiration box as required per manufacturer's recommendation.

F. Energy Monitoring:

1. System shall include kW/kWh monitoring of the building electrical service. Monitoring signal shall be tied to the electric service meter(s). Contractor shall coordinate with the service company for tie-in to monitoring point at meter. If such is not available, Contractor shall otherwise provide amperage meter at main feeder. Monitoring signals shall be provided for all electric meters serving each building.

G. Operational status for all circulating pumps, air handling units, A/C unit fans, heat pump fans, and exhaust and ventilation fans, shall be actuated by current sensing relays. The same device shall be arranged to activate an "operation failure" alarm on unintentional shutdown. Operational status of all other equipment shall be provided through unit status control contacts where available, or through interlock with respective starter auxiliary contacts.

1. Current Sensing Relays: Shall be solid-state electronic relay switch located in the line circuit for each fan or pump motor being monitored. Each relay shall be of the type to sense various off-normal or failure modes including power loss, motor failure, and/or loss of load via failure of belt, coupling, drive, etc.

H. Firestats (F/S): Shall be U.L. listed manual-reset type with an adjustable temperature cut-off initially set at 135°. Firestats shall be rated as necessary to handle the various fans throughout the system. Firestats shall be provided at each air handling unit, A/C unit, heat pump unit, fan & coil unit and exhaust/vent/supply fan unit throughout the project (except those provided with smoke detection deactivation). Where fans are interlocked with other equipment, actuation of any single firestat shall deactivate the entire system.

I. Protective Guards: All transmitters/controllers in high-traffic areas (cafeterias, gymnasiums, locker areas, auditoriums, corridors) shall be furnished with heavy duty protective guards where directed by the Owner, mounted with tamper-resistant hex screws and finished in color and/or style as selected by the Architect.

J. Control wiring and conduit shall be provided herein as necessary to accomplish the intent and operations called out. Cables and/or individual conductors may be used; however, each wire within a cable shall be separately color-coded and separately identifiable from all other wires within that cable. Color-coding may be repeated in other cables, except that identical cables with like number of wires shall be separately identifiable by coding of the cable. Where cables are used, conductors shall be encased in a continuous "Mylar" or "PVC" sheath. Wire sizes for trunk cable shall be not less than #16 for system selection power, #22 with shielding for intercom, #20 with shielding for thermocouples, #19 for humidity indication, and #19 for function selection, initiation, and operation. Thermocouple wire in cables shall be premium grade (+-3/4^{o}F) copper-constantan. Insulation of individual wires shall be not less than .016 PVC, and cable PVC jackets shall be not less than .040 inches thickness. Conductors shall be solid in lieu of stranded where possible.

K. Panel Wiring: All control panel internal electrical wiring shall be pre-wired to numbered relays and/or terminal strips. A wiring diagram of each panel as finally approved, with device and terminal strip identification, shall be permanently affixed within the panel enclosure.

L. Nameplates: All DDC controllers, as well as all pushbutton stations, switches, indicating lights, or control devices in all control panels shall be identified where not specifically obvious to unit served. Identification shall be bolt-on (self-tapping screws acceptable) engraved laminated plastic nameplates having white lettering on black background, except that engraving may be an integral part of panel fronts. Adhesive backed nameplates or embossed plastic tape identifiers are NOT acceptable.

M. Start-Stop Pushbuttons and Switches: All start-stop pushbutton stations associated with the control system shall be maintained or momentary contact type, as approved, to perform the desired functions. Except as otherwise noted, all switches shall have color-coded buttons, "Green-On", "Red-Off". “Hand-Off-Automatic” selector switches shall be industrial grade maintained contact type.

N. Indicator Lights: All pilot lights shall be of the 1" diameter oil-tight industrial grade or shall be integral parts of annunciator panels, each with 10,000 hour incandescent rating; and with transformers reducing voltages to a maximum lamp voltage of 48 volts. Color caps and lamps shall be interchangeable for each type and serviceable from the front of the panel.

O. Equipment Protection: All safety controls provided by others or as part of this contract such as smoke detectors shall be provided as independent and overriding control loops separate from the DDC operating system.

2.08 LOCAL CONTROL PANEL (LCP)

A. Furnish and install Local Control Panels, if and as required, for basic local control as specified herein. All control devices such as H-O-A switches, status lights, relays, alarms, etc., associated with each unit, other than valves, dampers, etc., which of necessity must be mounted directly on units or in piping, shall be installed within each enclosure as indicated on the plans.

B. Panel construction shall be structural steel or aluminum frame with bonderized enamel finish steel side, back, top, and bottom panels, arranged for wall mounting. Front panel shall be full piano hinged with cylinder lock and constructed in finished steel or anodized aluminum. All switches, lights, etc., shall be mounted on this hinged panel and neatly cabled to numbered terminal strips within the panel housing. All wiring and conductors between the panel and any remote equipment shall terminate at the terminal strips.

2.09 MISCELLANEOUS

A. Failure to mention any specific item or device, such as relays, switches, etc. required by the system; does not relieve this Contractor of the responsibility for furnishing and installing such device or item in order to comply with the intent of this specification.

PART 3 - INSTALLATION

3.01 INSTALLATION PROCEDURES

A. Shall be in strict conformance with the recommendations of the manufacturer, and components shall be located and arranged as specified herein and indicated on the drawings, or as otherwise approved by the Owner and Engineer.

B. Installation of all control systems shall be complete with all required controllers, sensors, valves and dampers, relays, switches, accessories, etc., and all wiring and interconnections as required for a complete and functioning installation that meets all sequences of operation and maintains desired temperatures and building conditions as required in the drawings and specifications.

C. The Automatic Control Contractor shall develop and enter all computer software data into the related computers including all graphics, control programs, initial approved parameters and settings, and English descriptors, as specified under PART 2. The Automatic Control Contractor shall maintain copies of all final data file and application software for reload use in the event of a system crash or memory failure, to be retained on separate storage device such as flash drive. One (1) copy shall be delivered to the Owner during training sessions, and one (1) copy shall be archived in the Contractor’s local software vault.

D. Where control equipment, devices or accessories are installed on covered casings, ductwork, etc., they shall be mounted on the finished surface of the covering. Care shall be taken that there are no leaks around stems or supports passing through metal work. All controllers, devices and accessories shall be located in accessible locations.

E. All modulating control valves, dampers, etc., shall operate in a gradual, linear manner without slamming or jerking. Control operation shall function satisfactorily without cycling or hunting. Control Contractor shall furnish any additional necessary controls, relays or dampering devices as required to maintain proper responsiveness.

F. The Control Contractor shall furnish all control valves and control dampers to the Mechanical Contractor for installation.

3.02 ROOM SENSORS AND THERMOSTATS

A. Room sensors and thermostats shall be mounted in close proximity to lighting switches, aligned directly above such switches as detailed or as otherwise directed, except not above dimmer switches on rheostats. Mounting locations shall be unobstructed by free air current, and shall be properly coordinated with other wall elements, subject to final approval by the Owner and Engineer. Mounting heights of room controllers shall be as required by ADA and TAS regulations. All room sensors only, or controllers not covered by ADA and TAS, shall otherwise be mounted at 5'-0" above finished floor, unless otherwise noted.

3.03 ELECTRICAL WIRING

A. The Automatic Control Subcontractor shall furnish and install all DDC control wiring, communications cable and associated control wiring, regardless of voltage, and shall furnish and install all associated conduit unless otherwise specified. All work shall be in accordance with applicable Division 26 specifications.

3.04 CONTROL DRAWINGS

A. The Control Subcontractor shall submit to the Engineer for approval, shop drawings of the entire control system before starting work, which shall include diagrammatic layouts of the control systems specified under PART 1, AND INTERLOCK WIRING DIAGRAM FOR ALL APPROVED EQUIPMENT AND/OR CONTROL ITEMS REQUIRING SAME. Layouts shall show all control equipment and the function of each item SHALL be indicated for the different seasons.

3.05 ADJUSTMENT

A. After completion of the installation, the Automatic Control Contractor shall regulate and adjust all sensors, DDC controllers, detectors, switches and other equipment provided under his contract. He shall place them in complete operating condition, subject to the approval of the Owner.

B. Contractor shall, in coordination with and as directed by the Owner, develop and establish all initial setpoints, operating schedules, graphical displays, menu structures, control and monitoring functions, operating sequences, etc., at the EMS Central Operator Workstation and designated PC's, as well as at all DDC controllers.

C. Automatic Control Contractor shall also verify correct control function and point signal, and general integrity of each input and output point at each DDC controller. Any control points found to be non-functioning shall be corrected with point repair list submitted for review.

D. Contractor shall prove the accuracy and adequacy of the control installation for the EMS, and shall verify actual and proven operating sequences, temperature conditions, control and monitoring functions, etc., are functioning properly.

E. Contractor shall verify complete and proper communication of all control data throughout network.

3.06 TESTING, ADJUSTING AND COMMISSIONING SUPPORT

A. Independent test verification of the installed DDC Energy Management System will be performed by a Test and Balance (TAB) Agency under separate subcontract for testing and balancing services. The Automatic Control Subcontractor shall completely install and confirm operation of the DDC energy management system prior to notifying the TAB Agency, including DDC control modules, sensors, networking, hardware, control programming, setpoints, schedules, graphics, etc. The Automatic Control Subcontractor shall also coordinate and assist the TAB Agency as required for his services, and shall make corrections to any and all deficiencies identified by the TAB Agency associated with the DDC energy management system. See Specification Section 23 9900 – TESTING, BALANCING AND COMMISSIONING.

B. If required, the Automatic Control Subcontractor shall furnish to the TAB Agency a portable operator's tool with preloaded software and necessary interface provisions for use during system balancing. The TAB Agency shall be responsible for proper use and care of this tool, and shall return it to the Automatic Control Subcontractor immediately upon balancing completion. The Automatic Control Subcontractor shall provide the TAB Agency up to four (4) hours training on the use of this tool in order to exercise actuators and enter calibration and balancing parameters, and shall provide additional technical support as required by the TAB Agency to carry out his work.

3.07 TRAINING

A. The Automatic Control Contractor shall, after the project is accepted by the Owner and occupied by him, instruct the Owner's operating personnel in the basic fundamentals of the control system operation, individual control operation and the regulation and maintenance of each type of control equipment. The Control Contractor shall also set up and supply a course of study for each of the Owner's operating personnel, including detailed information on each type of control component, maintenance instruction, and schedules, trouble shooting guides, and complete control system schematics (including wiring diagrams for all panels). The instruction phase shall be conducted by a manufacturer's certified instructor of the Control Contractor, who shall be assigned to the project for not less than two (2) working days of not less than eight (8) hours each. The Owner will schedule the instruction period after receipt and approval of the courses of study from the Control Contractor.

1. Contractor training of Owner's personnel shall also include complete software demonstration and operator's workstation including all system graphics, scheduling, setpoint and programming adjustments, and data monitoring.

2. Training instruction shall include one (1) additional day of eight (8) hours minimum, on-site, devoted to control and operation, service and maintenance, etc., of all variable frequency drives, provided that the controls contractor provided the drives.

PART 4 – SEQUENCE OF OPERATION

4.01 SEQUENCE OF OPERATION

A. Refer to the plans, to the various equipment schedules and I/O summary schedules indicated on the plans, as well as sequences of operation specified herein, for operational control and monitoring required for the various equipment items.

B. A/C Unit (Package Rooftop): Each A/C unit shall be controlled by a room temperature sensor, through unit digital controller, to stage unit fan, compressors, heaters, etc., to maintain setpoint space temperature under occupied and night setback modes as specified.

1. Temperature cooling control of each A/C unit 3-tons and greater shall be two-stage minimum with variable air flow control. DDC shall stage two-stage compressors, as well as Lo/Hi fan speed control, in accordance with unit manufacturer's requirements, as follows:

a. First Stage Cooling – Stage first-stage compressor, activate low fan speed, and open outside air damper to minimum scheduled position.

b. Second Stage Cooling – Stage maximum cooling compressor and activate high fan speed control. (See Section 23 8000 for A/C Unit Specifications.)

c. Large units with more than two stages of cooling shall be controlled for multiple fan speeds in association with each cooling stage.

d. Two-stage heating control shall similarly stage fan speed, with first-stage heating controlled through unit ignition control system for purge and preheat operation.

2. Humidity Control: Room temperature and humidity sensors shall be provided for designated a/c units with hot gas reheat for dehumidification control as scheduled on the drawings. Room temperature and humidity sensors shall, through digital controller, stage compressor and supply fan, and operate hot gas reheat coil, in accordance with unit manufacturer’s requirements, as follows:

a. Room temperature sensor shall, through DDC controller, stage cooling compressor and variable-speed supply fan to maintain room temperature setpoint as specified under Subparagraph 1.. Cooling shall be minimum two-stage control for: low-cool/low-fan, high-cool/high-fan. Hot gas reheat coil shall remain closed during straight cooling mode.

b. When temperature is satisfied, room humidity sensor shall stage compressor and fan as described above, and shall operate hot gas reheat coil, to maintain space humidity setpoint (60% RH; adjustable).

c. Unit supply fan shall automatically switch to cycle mode whenever dehumidification control is activated.

d. Dehumidification control shall not be allowed to operate during unit heating mode.

3. All standard non-humidity units identified with room humidity sensors shall be capable of providing overriding control of A/C unit(s) serving each space, as follows:

   a. Automatically switch fan mode to cycle with compressor.
   b. Automatically lower temperature setpoint by 2°F (adjustable).
   c. Control graphics page shall include software switch to enable humidity control if desired by the DDC Operator.
   d. Shall apply to units not already specified above with humidity control in the foregoing control sequences.

4. Each stage of cooling and heating shall have adjustable temperature settings relative to setpoint.

5. Where indicated on the drawings, individual room sensors shall be provided for multiple rooms served by a single RTAC unit, with averaging and/or high demand control for heating and cooling. Control graphics page shall include software switch to enable/disable control sequence as desired by the DDC operator.

6. Unit Ventilation Control: Unit outside air dampers shall open to minimum scheduled ventilation position when unit fan is energized, and shall close when de-energized. Operation of outside air damper shall be based on proven status of unit fan (i.e., damper shall remain closed until fan current sensor indicates fan is running).

   a. CO_2 Control (All Designated Units): CO_2 sensor shall, through the digital controller, modulate unit outside air dampers down from scheduled ventilation position to maintain CO_2 setpoint of 1200 ppm (adjustable). In no case shall damper modulate above scheduled ventilation position, nor below 5% total system air flow (adjustable). CO_2 control shall be overridden by economizer operation as specified below.

      1) CO_2 sensor shall automatically set unit fan to continuous run whenever CO_2 rises above 3000 ppm (adjustable).

   b. A/C Units Scheduled with Unit Economizer Operation: Global outside air temperature and humidity sensors shall, through unit digital controller, override CO_2 control and operate economizer control for free-cooling whenever the outside air enthalpy is below setpoint enthalpy (65°F, 60% RH; adjustable). Economizer control shall be deactivated whenever the outside air enthalpy is above enthalpy setpoint.

      1) Supply air temperature sensor shall, through digital controller, modulate the outside air and return air control dampers to maintain supply air temperature setpoint (55°F; adjustable).

      2) Upon a further call for cooling, room temperature sensor shall control first-stage compressor to maintain room temperature setpoint.

      3) Economizer control shall be locked-out whenever unit is under heating mode operation.

4) Economizer shall be monitored by the DDC for fault detection and diagnostics (FDD) in accordance with the IECC.

c. Control damper operators shall be furnished and installed by the Automatic Control Contractor for A/C unit damper assemblies as specified under Section 23 8000 – UNITARY HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT.

7. The supply fan mode shall be user selectable to determine how the supply fan will operate during unit operation. Continuous fan operation will operate the fan continuously during unit operation. Cycle fan operation will cycle the fan with compressor and heater based on heating and cooling demand. Fan shall be initially set for cycle mode.

8. Separate setpoints for heating and cooling shall be provided, with adjustable deadband range from 0°F to at least 5°F.

9. Night Setback: During the unoccupied mode each A/C unit shall be controlled for night setback through its digital controller as follows:

a. Heating Setback: Each A/C unit shall be staged for heating to maintain space temperature of 55°F (adjustable). Unit outside air damper shall remain closed during setback mode.

b. Cooling Setback: A/C unit shall be staged for cooling to maintain space temperature of 85°F (adjustable).

1) Unit outside air dampers shall remain closed during setback mode, unless overridden by economizer control.

c. Unit fan shall be set for cycle mode during setback period.

10. Warm-Up/Cool-Down: Start sequence for occupied operation shall include warm-up/cool-down mode. Ventilation dampers shall remain closed and associated ventilation fans shall remain deactivated until room occupied setpoint is reached.

11. All control functions, unit operation and primary monitoring points specified herein and scheduled on the drawings shall be carried via individual direct-wired control points from DDC controller to a/c unit factory controller connections. BacNet communication shall not be the primary means of control interface. However, this DDC Contractor shall also connect to a/c unit BacNet communication port for additional monitoring points available by unit manufacturer, to be set up through the building DDC & EMS system where directed by the Owner.

C. Kitchen Hood Make-Up Air A/C Unit:

1. Each unit shall be enabled from scheduled occupied mode, and shall be interlocked with associated cooking hood switch to operate only when hood exhaust fans are on. When unit is energized, outside air dampers shall open to 100% outside air position as scheduled before supply fan starts to run. Dampers shall close when unit is de-energized.

2. Cooling Mode: Supply air temperature sensor located in supply duct shall, through DDC controller, modulate cooling compressors to maintain supply air temperature setpoint (74°F, adjustable).

3. Heating Mode: Supply air temperature sensor shall, through DDC controller, modulate gas heating burner to maintain supply air temperature setpoint (65°F, adjustable). Cooling shall be locked-out during heating control.

4. Room temperature sensor shall, through DDC controller, automatically reset supply air setpoints to maintain upper and lower room limits (adjustable).

5. Unit cooling and heating control shall be fully modulating and integrated to maintain neutral supply air conditions to room during operation.

6. Economizer Ventilation: Global outside air temperature and humidity sensors shall, through unit digital controller, override CO_2 control and operate economizer control for free-cooling whenever the outside air enthalpy is below setpoint enthalpy (65°F, 60% RH; adjustable). Economizer control shall be deactivated whenever the outside air enthalpy is above enthalpy setpoint.

    a. Supply air temperature sensor shall, through digital controller, modulate the outside air and return air control dampers to maintain supply air temperature setpoint (55°F; adjustable).

    b. Upon a further call for cooling, room temperature sensor shall control first-stage compressor to maintain room temperature setpoint.

    c. Economizer control shall be locked-out whenever unit is under heating mode operation.

    d. Economizer shall be monitored by the DDC for fault detection and diagnostics (FDD) in accordance with the IECC.

7. Unit factory controllers and components for operating and safety controls shall be operable and interfaced with DDC control as required. Factory safety and override functions shall remain intact, including hi/low pressure switches, evaporator freezestat, hot gas bypass, low ambient function, anti-short cycle, etc. Refer to SECTION 23 7000 – 100% OUTSIDE AIR PACKAGE A/C EQUIPMENT.

8. Building system components required for unit control including sensors, controllers, wiring and devices shall be provided as part of the building DDC system by the Automatic Control Contractor. Control Contractor shall also provide interface to unit controller as required for proper transmission of DDC control signals, as well as operator EMS point monitoring, setpoint adjustments of all control parameters, equipment operation scheduling, etc. Automatic Control Contractor shall coordinate with unit manufacturer for proper means of integrated DDC and EMS interface with each OA unit.

D. VAV Terminal: Room sensor shall, through DDC controller, modulate VAV control damper to maintain room temperature setpoint (adjustable). Controller shall switch between direct and reverse action for heating and cooling control based on heating/cooling mode of the associated A/C unit.

E. During scheduled unoccupied "night setback" periods, ventilation dampers shall remain closed, and ventilation/exhaust fans and relief fans shall be scheduled to remain off.

F. In addition to control sequences specified herein, all HVAC equipment including exhaust and ventilation fans shall be controlled and monitored through the DDC as indicated in the Mechanical Equipment Control Schedules.

G. Crawl Space Ventilation: Temperature and humidity sensors located in the crawl space shall, through DDC controller, cycle crawl space ventilation fan to maintain both temperature and humidity setpoints.

H. Temperature-Controlled Exhaust Fans: Where indicated on the drawings, temperature sensor shall, through DDC controller, cycle exhaust fan to maintain temperature setpoint.

I. Hot Water Circulation Control: Provide DDC scheduled start/stop control and unit monitoring for each water heater, as well as each hot water circulating pump serving each recirculated domestic hot water system, as scheduled on the drawings.

1. When pump is started, return water temperature sensor located in the recirculated hot water return line shall, through the DDC controller, cycle hot water circulating pump to maintain return water temperature of 100^{o}F (adjustable).

J. Exterior Lighting Control: All exterior lighting shall be controlled and monitored through the DDC for programmed operation via Owner-defined operating schedules.

1. Each exterior lighting zone shall be energized through the DDC by an exterior ambient illumination sensor, and shall be de-energized by programmed off scheduling. Illumination sensor shall include adjustable illumination setpoint.

2. Independent control of each lighting zone shall be provided through DDC output points and control relay for each lighting circuit.

3. Each lighting zone shall be monitored through DDC for true operating status via load-side current sensors.

4. Dynamic graphical site display shall be developed at Operator’s Workstation to indicate control and status of each lighting zone, with each zone properly identified as directed.

5. Lighting control for each circuit shall include local H-O-A switch for manual override operation.

6. Refer to Electrical Drawings and Specifications for quantity of lighting circuits to be controlled as well as circuit and lighting arrangements. Coordinate with Electrical Contractor for proper control interface with lighting relay panel.

7. DDC interface with any local lighting controller shall be fully compatible for seamless integration with DDC & EMS control system.

K. The walk-in cooler and freezer in the Kitchen area shall each include a DDC space sensor which shall monitor space temperature through the DDC energy management system, and shall activate high/low temperature alarm conditions including telephone or email notification as determined by the Owner as specified under Alarm Conditions and Maintenance Messages.

L. Automatic Control Contractor shall coordinate with Mechanical Contractor and A/C Unit Manufacturers to provide proper interface with factory unit controllers, terminal connections, damper motors, etc., to provide proper control and operation of each unit as specified.

END OF SECTION

SECTION 23 9100

EMERGENCY STORM SHELTER CONTROL SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Divisions 22, 23, 26, and 28 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

C. Refer to SECTION 23 9000 – DDC Energy Management System.

1.02 GENERAL SCOPE OF WORK

A. Complete storm shelter control and automation system shall be furnished and installed for the various emergency systems in accordance with the plans and specifications. Shelter control system shall be a turn-key installation as an extension to the building DDC energy management system specified under Section 23 9000. System shall include programmable DDC controller(s) and all supporting switches, status lights, relays, dampers, valves, actuators, components, etc., furnished by “Reliable Controls” and installed by “Enviromatic Systems”, under an Automatic Control Sub-Contract. This section of the specifications includes all labor and materials required for the complete and finished installation of the following:

1. Central Storm Shelter Control Panel
2. Control Panel and DDC control components
3. Automatic system control components and control & communication wiring

1.03 CODES AND REGULATIONS

A. Perform all work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are exceeded by the contract documents.

B. The equipment, materials and installation shall confirm to the latest version of all applicable codes, standards and regulations of authorities having jurisdiction including the following:

1. ICC 500, Standard for the Design and Construction of Storm Shelters.
2. NFPA 70, National Electrical Code.
3. NFPA 101, Code for Safety to Life from Fire in Buildings and Structures.
4. American with Disabilities Act.
5. Texas Accessibility Standards
6. International Building Codes (IBC).
7. Local and State Building Codes.
8. All requirements of the local Authority Having Jurisdiction (AHJ).

1.04 RELATED WORK SPECIFIED ELSEWHERE

A. Electrical Work
B. Automatic Control Work
C. Heating and Air Conditioning Equipment
D. Fans
E. Valves

1.05 COORDINATION

A. Automatic Control Contractor shall be responsible for communicating to and coordinating with the other Contractors for any and all supporting mechanical work, electrical work and general construction support, as required to carry-out complete installation of the new storm shelter control system.

1. The Mechanical Contractor (via unit manufacturer) shall furnish and install at his expense pre-wired contact connection points at starting devices applicable for control of all associated storm shelter ventilation fans, including magnetic contactors for three phase motors and relay contactors for single phase motors (and 24 VAC control transformers as required).

2. The Mechanical Contractor shall also install all field control devices furnished by Automatic Control Contractor that are integral to mechanical distribution, such as control dampers (not factory-furnished), immersion wells and couplings, etc.

3. The Electrical Contractor shall furnish and install all power wiring and all direct equipment interlock control wiring called for on the plans, and/or otherwise required. The Electrical Contractor shall provide all electrical work supporting the DDC control system, including extensions of 120 volt power circuits and outlets, as directed by the Automatic Control Contractor and/or as specified herein. The Electrical Contractor shall also furnish and install all recessed sensor boxes and control conduit required to be installed within walls and chases from room sensors and controllers throughout the building, as directed and required by the Automatic Control Contractor and/or shown on the drawings.

B. The Automatic Control Contractor shall furnish and install under this contract all on-site control panels, DDC control equipment, control buttons, switches & status lights, control components, relay boards, temperature and CO_2 controlling sensors, etc.; and all associated control wiring from such control devices in panels and elsewhere up to and connecting at appropriate connection points at fan starters, relays, damper/valve operators, sensors, and all other field components. The Automatic Control Contractor shall furnish and install all associated control conduit where specified or required for outside, below floor, underground and exposed. Conduit within walls and chases will be provided by the Electrical Contractor. The Automatic Control Contractor shall furnish and install all new damper operators (not factory-furnished), transducers, etc., and shall also furnish all control dampers (not factory-furnished), immersion wells and couplings, etc., to the Mechanical Contractor for installation.

1. It is intended that all control hardware including DDC controllers, control buttons, switches and status lights, local control relays, etc., shall be installed in the Emergency Storm Shelter Control Panel assembly as specified under this section and detailed on the drawings, located in the Storm Shelter Control Room. Location and coordination of proper wall space for control hardware shall be the responsibility of the Automatic Control Contractor, subject to review and approval by the Owner.

1.06 SUBMITTALS

A. Submit manufacturer's certified rating data, descriptive literature, catalogue cuts, shop drawings, etc., for all proposed:

1. DDC controllers, sensors, control devices and equipment
2. Control dampers, valves and actuators
3. Automation system and communication components
4. Description of software and graphic interface programs

B. Submit control product brochure to include make, model and detailed technical description of DDC controllers, sensors, and devices proposed for the project.

C. Submit shop drawings representing complete control, LAN and interlock wiring diagrams for the Storm Shelter Control Panel assembly, switching and status arrangements, DDC and control sub-systems, and field devices and controlled equipment; with complete descriptions of the sequence of operation of all systems and their effect on other equipment and systems.

D. Shop drawings shall represent Shelter floor plans, control panel assemblies, system flow diagrams and EMS network arrangements for all switching and control devices, DDC controllers, sensors, field components, etc. Shop drawings shall be project-specific and shall include the following:

1. Distributed locations of DDC control and communication modules, and temperature and humidity sensor locations, throughout the building or site, with wiring distribution and legend of all wire color.

2. Point-by-point diagram of control circuitry within Shelter Control Panel for each control button/switch, status light, DDC controller, relay, as well as scheduled list of each control point per controller as to point identification address, type, function, and equipment, system and/or area served. Schedule shall be categorized by unit name and ID address of each controller, as well as ID number of each component served.

3. Complete control damper schedules representing size, type, capacity, manufacturer and system served.

4. Complete descriptions of sequence of operation, with supporting system flow diagrams of all equipment and systems served, representing applicable control devices properly correlated to DDC controllers and panel control devices.

5. Typical representations for identical systems are acceptable, provided all applicable units are listed and identified.

1.07 CLOSE-OUT DOCUMENTS

A. Record Drawings: At the completion of the project, the Automatic Control Contractor shall submit complete Record Drawings to include all shop drawing documentation described above, including floor plan drawings, control panel drawings, and wiring diagrams, which shall indicate actual installation of DDC and control component and device locations, network and wiring configurations, etc. This shall include documentation, software, all control logic and all associated support documentation on approved media accurately representing the final installed system.

B. Operation Manuals: Submit three (3) copies of complete manufacturer's instructions and drawings for installation, maintenance and operation of all hardware components and devices, as well as complete description on the use and function of all programming and interface software.

C. Automatic Control Contractor shall submit one (1) hard set of record drawings and documents, as well as one (1) electronic copy electronically downloaded, or provided on disk or USB storage device, to be delivered to the Owner. Record drawings shall be submitted in standard program formats such as Autocad, .pdf, .doc, etc.

1.08 GUARANTEE AND SERVICE

A. The control system herein specified shall be free from defects in workmanship and material under normal use and service. If within two (2) years from date of acceptance by the Owner, any of the equipment described herein is found to be defective in workmanship or material, it shall be repaired free of charge. Warranty shall cover all costs of parts, labor, travel, software modifications, and other applicable expenses throughout the warranty period.

B. In addition, the Control Contractor shall, after completion of the original tests of installation, instruction of the Owner's personnel, and acceptance by the Owner, provide any service incidental to the proper performance of the control system for a period of two (2) years free of any additional cost to the Owner.

C. In the event of disagreement as to Control Contractor liability above, the decision of the Owner and the Engineer shall be final.

PART 2 - PRODUCTS

2.01 GENERAL

A. It is the intention of this portion of the specifications to describe the Emergency Storm Shelter Control System as a turn-key, fully integrated and compatible with DDC Energy Management System under Section 23 9000.

B. Systems shall be furnished and installed in all respects, including any and all equipment, controls, wiring, instrumentation, enclosures, labor, engineering, training, commissioning, programming, supervision, calibration, coordination with other trades, etc. It is the intent of these specifications that the Contractor shall furnish and install the systems complete in every respect and ready to operate. All equipment, miscellaneous items and accessories required for such installation and for the correct and convenient operation of the entire installation whether or not each such item or accessory is shown on the plans or mentioned in these specifications shall be furnished and installed.

C. DDC controllers and all other products and components shall be furnished by “Reliable Controls”, and shall match all similar products specified under Section 23 9000.

D. Shelter control system shall be integrated onto building DDC Energy management system for remote control and monitoring via operator interface. Dynamic graphical and tabulated interface control points, monitoring data and alarm reporting shall be set up by the Automatic Control Contractor as part of the building EMS interface under Section 23 9000.

E. Codes, Permits, and Fees: This contractor shall comply with all local, state, and national codes, and shall secure and pay for all applicable cost, fees, permits, and licenses. No additional cost shall be allowed for these items.

F. All equipment for which there are Underwriters’ Laboratories Standard requirements shall be listed by Underwriters’ Laboratories and be so labeled.

2.02 EMERGENCY STORM SHELTER CONTROL PANEL & SYSTEM COMPONENTS

A. Furnish and install one (1) wall-mounted control panel enclosure located in the Shelter Control Room as shown on the drawings; “Hoffa” CONCEPT Flush-Mounted Steel Enclosures model CP1612 with wall mounting brackets and key lock kits, or equal.

1. Panel enclosure shall include solid bonderized enamel steel cover, and shall contain DDC controller(s) and all control relays specified herein.
2. Operator activation devices shall be provided to include main activation button, with hand-off-automatic switch below button and status indicator lights below switch; all surface-mounted on front cover of control panel, and properly labeled as specified.
3. Panel construction shall be structural steel or aluminum frame with bonderized enamel finish steel side, back, top and bottom panels with knockouts for wiring; arranged for wall mounting. Front panel cover shall be full piano hinged with cylinder lock. Internal devices shall be neatly cabled to numbered contact terminals.

B. Programmable DDC Controller: Provide Stand-alone programmable DDC controller(s) similar to “Reliable” controllers specified under Section 23 9000, to carry out control and status indication of emergency systems serving the Storm Shelter.

C. The Emergency Storm Shelter Control System manual activation devices shall be comprised of a mushroom-type push-button activation switch with integral key reset switch, and with associated keyed H-O-A switch and LED status lights, as follows:

1. One large mushroom-button with Custom English Two Line label marked “EMERGENCY VENTILATION”. Button shall include background indicator light showing button is active. STI model SS2100ZA-EN, Green Shell, No cover, Push Button #0 Key to Reset
2. Key operated Hand-Off-Automatic selector switch (H-O-A) with labeled positions, located adjacent to button switch; “Grainger”, or equal.
3. Menics LED Indicator Light model M06F24G, or equal. Indicator LED Green 24VDC, to indicate fan operating status.
4. Second Menics LED Indicator Light model M06F24R, or equal. Indicator LED Red 24VDC, to indicate fan alarm status.
5. Menics LED Indicator Light for each vent control damper (total of 2), model M06F24G, or equal. Indicator LED Green 24VDC, to indicate open-position of each control damper.
6. Status lights shall be located below associated control device, and shall be individually labeled to each associated fan & control damper.

D. EMERGENCY VENTILATION: Button switch shall be colored green and shall initiate control operation of system ventilation control dampers and activation of the emergency ventilation fan, through the DDC system. The button shall light up showing switch is engaged. When the key reset is initiated the emergency ventilation fan shall deactivate and all system control dampers shall close. Damper position switches shall be provided to prove fully-open damper position before ventilation fan is allowed to start, and to activate damper status indicator light for each control damper. Fan status shall be provided via current sensor relays to activate status indicator lights. The emergency ventilation system shall only be initiated via this button or through the DDC software and through no other interface.

   a. Normal position of H-O-A selector switch shall be in “Auto”, to enable control operation of ventilation system. “Hand” and “Off” positions are to be used for manual override if needed.
   b. Room temperature and CO2 sensors shall be provided in Storm Shelter to automatically operate control dampers and cycle ventilation fan to maintain setpoints when system is enabled by button switch and H-O-A switch is in “Auto” position.

E. For all Emergency Storm Shelter Control functions other than the ventilation fans, each control relay shall be mounted adjacent to DDC controller on backer board inside Shelter Control Panel enclosure with conduit knockouts. Relays shall be U.L. recognized and rated for ten million mechanical operations. At each location provide two Air Products & Controls models # MR-201/C relays, or equivalent, one for the emergency function, and one for the reset function. Relays shall be operated by a multi-voltage coil (24 VDC), feature DODD dry Form C contacts rated 10 Amps @ 120 VAC, and a status LED to indicate that the relay is energized.

F. For emergency ventilation fan, control relay shall be Square Latching Plug-in Relay, 24VDC control coil, 8-pin square base latching plug-in relay with an AC contract rating of 16A@277V, Dayton Model 1EHY3, or equal.

G. Shelter Control Panel assembly shall be mounted at approximately 48” AFF measured from the bottom of the panel enclosure. Provide white label with red text at the button switch on the front cover of the control panel enclosure. Text shall read “Press control button to activate tornado shelter emergency ventilation control system”. Indicator lights shall be labeled as “Fan On”, “Fan Alarm”, “OA Damper Open”, and “Relief Damper Open”.

H. Automatic Control Contractor is responsible for all necessary wiring and programming of stand-alone controller to building DDC system. Emergency storm shelter control system status shall be displayed and monitored through DDC front end. All activation and control of emergency storm shelter control system shall be through stand-alone controller.

2.03 FIELD DEVICES AND COMPONENTS

A. Storm-Rated Control Air Dampers: Provide 2-position automatic storm-rated control dampers for emergency ventilation system, where shown on the drawings. Damper assembly shall be parallel blade type of heavy gauge galvanized steel construction, and shall include low-leak damper blades with blade seals, flanged damper frame, rods, linkages, bearings and control damper operator, for a complete assembly; “Greenheck” Series HCD-530. Damper shall be constructed to withstand tornado storm forces, and rated for a minimum 40 inch WG differential air pressures, at air velocities up to 6000 FPM.

1. Control damper operators shall be 2-position spring-loaded electric operator with heavy torque operation, normally-closed; “Belimo”, or equal. Operator shall be 120V service, to be coordinated with the Electrical Contractor.

2. Control dampers shall include damper position switches for positive status for open position.

3. Control dampers shall be furnished by Automatic Control Contractor to Mechanical Contractor, for installation by Mechanical Contractor.

B. Room Temperature Sensor and Carbon Dioxide Sensor for emergency ventilation control: Reliable SMART sensor model SS3-E-Temp-CO2, or equal.

C. Operational status for ventilation fans shall be actuated by current sensing relays. The same device shall be arranged to activate an "operation failure" alarm on unintentional shutdown.

1. Current Sensing Relays: Shall be solid-state electronic relay switch located in the line circuit for each fan motor being monitored. Each relay shall be of the type to sense various off-normal or failure modes including power loss, motor failure, and/or loss of load via failure of belt, coupling, drive, etc.

D. Automatic Control Contractor shall furnish and install all necessary actuators and control wiring between stand-alone DDC controller, button switches & lights, control relays, and storm shelter components such as emergency ventilation fan, control dampers, sensors, etc.

E. 1” conduits installed from the nearest accessible ceiling space to the inside of the wall control panel. All conduit and protective bushings to be provided and installed by Electrical Contractor. Install single gang back boxes inside the control panel for a dedicated pathway for each wire that will run to a specific device.

2.04 CONTROL WIRING

A. Control wiring and conduit shall be provided herein as necessary to accomplish the intent and operations called out. Cables and/or individual conductors may be used; however, each wire within a cable shall be separately color-coded and separately identifiable from all other wires within that cable. Color-coding may be repeated in other cables, except that identical cables with like number of wires shall be separately identifiable by coding of the cable. Where cables are used, conductors shall be encased in a continuous "Mylar" or "PVC" sheath. Wire sizes for trunk cable shall be not less than #16 for system selection power, #22 with shielding for intercom, #20 with shielding for thermocouples, #19 for humidity indication, and #19 for function selection, initiation, and operation. Thermocouple wire in cables shall be premium grade (+-3/4^{o}F) copper-constantan. Insulation of individual wires shall be not less than .016 PVC, and cable PVC jackets shall be not less than .040 inches thickness. Conductors shall be solid in lieu of stranded where possible.

B. All new conduit shall be U.L. approved EMT with threaded or setscrew couplings. Any exterior conduit shall be galvanized rigid steel with threaded couplings. All exposed conduit in occupied spaces shall be painted.

2.05 MISCELLANEOUS

A. Failure to mention any specific item or device, such as relays, switches, etc. required by the system; does not relieve this Contractor of the responsibility for furnishing and installing such device or item in order to comply with the intent of this specification.

PART 3 - INSTALLATION

3.01 INSTALLATION PROCEDURES

A. Shall be in strict conformance with the recommendations of the manufacturer, and components shall be located and arranged as specified herein and indicated on the drawings, or as otherwise approved by the Owner and Engineer.

B. Installation of all control systems shall be complete with all required control panels, DDC controllers, sensors, control dampers, relays, switches, accessories, etc., and all wiring and interconnections as required for a complete and functioning installation that meets all emergency control operations serving the Storm Shelter as required in the drawings and specifications.

C. All control dampers, etc., shall operate in a gradual, linear manner without slamming or jerking. Control operation shall function satisfactorily without cycling or hunting. Control Contractor shall furnish any additional necessary controls, relays or dampering devices as required to maintain proper responsiveness.

D. The Control Contractor shall furnish all control dampers to the Mechanical Contractor for installation by the Mechanical Contractor.

3.02 CONTROL WIRING INSTALLATION

A. Control Wiring: All cabling for control and data wiring, and network LAN wiring, required for interconnection of DDC controllers, switches and indicator lights, control relays, remote sensors, vent fans, control damper operators, and all other devices furnished under this contract, as well as all supporting conduit, box, and devices, shall be furnished and installed by trained representatives of the Automatic Control Subcontractor. Responsibility for timely coordination with the Electrical Sub-Contractor to accommodate any special requirements of the Automatic Control Subcontractor shall be that of the Automatic Control Subcontractor, and as interpreted by the Engineer. Final routing and arrangement of all cabling shall be documented by approved control shop drawings, and reflected appropriately on as-built drawings for the building. Splicing of cables between terminal points of connection to devices or equipment is expressly prohibited.

B. Wiring shall be installed within the building envelope in walls, above ceilings, or exposed where necessary. Wiring shall be neatly bundled and supported from the structure by “J” hooks. Exterior wiring and conduit may be allowed only as approved by the Owner/Engineer.

C. All wiring shall be run in conduit where run below floor, concealed in walls or chases, or exposed. Wiring above ceilings will not require conduit but shall be plenum-rated cabling properly supported to structure. All conduit and boxes shall be installed by Automatic Control Contractor, except that control conduit in walls to room sensors shall be installed by Electrical Contractor as directed by Automatic Control Contractor.

D. All control wiring shall be low voltage (i.e., 24 VAC) where possible. Devices requiring 120 volts or greater may be used only as expressly approved by the Owner. All wiring and conduit installations shall be in accordance with NEC and applicable sections of Division 26 specifications.

E. Building LAN network wiring shall be twisted shielded pair, 18-guage through 24-guage, as suitable to DDC system being installed.

F. Any wiring penetrating fire rated wall/floor shall be provided with sleeve, conduit and UL Listed fire-stop caulk to maintain fire rating. Annular space through non-rated walls shall otherwise be filled with non-combustible mineral wool, fiberglass, cellulose insulation, and/or sealant, as required.

G. Wiring shall be suitably tagged and identified as to use and function. Color of automation control wiring shall be per Owner protocol for existing systems, and shall be coordinated with General Contractor or as specified in this document.

H. Panel Wiring: All control panel internal electrical wiring shall be pre-wired to numbered relays and/or terminal contacts. A wiring diagram of each panel as finally approved, with device and terminal identification, shall be permanently affixed within the panel enclosure.

I. Interface wiring with building Ethernet system for DDC system communication with central EMS shall be coordinated with Division 27 Subcontractor.

3.03 ELECTRICAL WIRING

A. The Automatic Control Subcontractor shall furnish and install all DDC control wiring, communications cable and associated control wiring, regardless of voltage, and shall furnish and install all associated conduit unless otherwise specified. All work shall be in accordance with applicable Division 26 specifications.

B. All control components and devices at Shelter Control Panel assembly and at all controlled equipment shall be circuited from Storm Shelter emergency power.

3.04 ADJUSTMENT AND VERIFICATION TESTING

A. After completion of the installation, the Automatic Control Contractor shall regulate and adjust all sensors, DDC controllers, detectors, switches and other equipment provided under his contract. He shall place them in complete operating conditions, subject to the approval of the Owner.

B. Automatic Control Contractor shall in coordination with and as directed by the Owner, develop and establish all initial setpoints, operating schedules, graphical displays, menu structures, control and monitoring functions, operating sequences, etc., at the EMS Central Operator Workstation and designated PC's, as well as at all DDC controllers.

C. Automatic Control Contractor shall also verify correct control function and point signal, and general integrity of each input and output point at each DDC controller, as well as all control components and devices, switches, indicator lights, relays, etc. Any control components and DDC control points found to be non-functioning shall be corrected with point repair list submitted for review.

D. Contractor shall prove the accuracy and adequacy of the control installation for the EMS, and shall verify actual and proven operating sequences, temperature conditions, control and monitoring functions, etc., are functioning properly.

E. After completion of the installation, Contractor shall perform calibration and adjustment of all sensing and control devices, and shall carry out services incidental to the proper performance of all sensing and control devices, and shall carry out services incidental to the proper performance of the control system. Temperature sensors shall be calibrated to less than or equal to a 1/4°F resolution for the specific applications.

F. Contractor shall verify complete and proper communication of all control data throughout network.

G. The Control Contractor shall submit a written statement certifying that all point-to-point checks have been completed, including a list of any incomplete or inoperative devices found. Control Contractor shall also document and submit detailed calibration and checkout log representing the calibration and adjustment activities performed. Certification statement shall be submitted no later than five (5) days prior to substantial completion review.

3.05 TESTING, ADJUSTING AND COMMISSIONING SUPPORT

A. Independent test verification. of the installed Storm Shelter Control System will be performed by a Test and Balance (TAB) Agency under separate subcontract for testing and balancing services. The Automatic Control Subcontractor shall completely install and confirm operation of the control system prior to notifying the TAB Agency, including DDC control modules, devices, sensors, networking, hardware, control programming, setpoints, schedules, graphics, etc. The Automatic Control Subcontractor shall also coordinate and assist the TAB Agency as required for his services, and shall make corrections to any and all deficiencies identified by the TAB Agency associated with the DDC energy management system. See Specification Section 23 9900 – TESTING, BALANCING AND COMMISSIONING.

B. If required, the Automatic Control Subcontractor shall furnish to the TAB Agency a portable operator's tool with preloaded software and necessary interface provisions for use during system balancing. The TAB Agency shall be responsible for proper use and care of this tool, and shall return it to the Automatic Control Subcontractor immediately upon balancing completion. The Automatic Control Subcontractor shall provide the TAB Agency up to four (4) hours training on the use of this tool in order to exercise actuators and enter calibration and balancing parameters, and shall provide additional technical support as required by the TAB Agency to carry out his work.

3.06 TRAINING

A. The Automatic Control Contractor shall, after the project is accepted by the Owner and occupied by him, instruct the Owner's operating personnel in the basic fundamentals of the control system operation, individual control operation and the regulation and maintenance of each type of control equipment. The Control Contractor shall also set up and supply a course of study for each of the Owner's operating personnel, including detailed information on each type of control component, maintenance instruction, and schedules, trouble shooting guides, and complete control system schematics (including wiring diagrams for all panels). The instruction phase shall be conducted by a manufacturer's certified instructor of the Control Contractor, who shall be assigned to the project for not less than two (2) working days of not less than eight (8) hours each. The Owner will schedule the instruction period after receipt and approval of the courses of study from the Control Contractor.

B. Contractor training of Owner's personnel shall also include complete software demonstration and operator's workstation including all system graphics, scheduling setpoint and programming adjustments and data monitoring.

PART 4 – SEQUENCE OF OPERATION

4.01 SEQUENCE OF OPERATION

A. Refer to the plans, to the various equipment schedules and I/O summary schedules indicated on the plans, as well as sequences of operation specified herein, for operational control and monitoring required for the various equipment items.

B. STORM SHELTER CONTROL PANEL – EMERGENCY VENTILATION:

1. Pressing button switch on panel front cover shall, through DDC controller, enable control operation of emergency ventilation system.

2. After button is pressed and H-O-A selector switch is in “Auto” position, ventilation system shall remain off until power outage of main building service has occurred and Shelter has switched to emergency power served by inverter. Provide power relay to monitor main building service, located inside control panel. Upon power outage relay shall, through DDC controller, engage ventilation system control.

3. When engaged, room temperature and CO2 sensors located in Shelter space shall, through DDC controller, operate outside air and relief air control dampers, and cycle emergency ventilation fan, to maintain room setpoints:

   a. System shall cycle on whenever room temperature rises above 90 deg, and shall cycle off whenever temperature drops below 80 deg (all adjustable).
   b. System shall cycle on whenever room CO2 rises above 2800 ppm, and shall cycle off whenever CO2 drops below 2000 ppm (all adjustable).
   c. CYCLE ON: Control dampers shall operate to fully open position and vent fan shall energize, in sequence, whenever room temperature or CO2 rises above respective setpoint.
   d. CYCLE OFF: Vent fan shall de-energize and control dampers shall close, in sequence, when both temperature and CO2 are satisfied.
   e. Vent fan shall not be allowed to energize until control dampers are at fully-open position as sensed bv damper position contacts.

4. H-O-A selector switch on panel front cover shall be circuited to provide manual override control of ventilation system when button is pressed, as follows: “Auto” position initiates controlled mode through DDC controller as specified above (normal position); “Hand’ position energizes ventilation system manually to run continuously (dampers and vent fan); “Off” position de-energizes and keeps off ventilation system.

5. Current sensor at vent fan shall, through DDC controller, monitor and indicate when vent fan is running, and shall energize green status indicator light. When fan is off indicator light shall be de-energized. Current sensor shall also be used to energize red indicator alarm light whenever ventilation fan is in alarm condition. Alarm status shall include fan off when called to be running, and fan running when not called to be energized.

6. Damper position switches at outside and relief air control dampers shall, through DDC controller, monitor and indicate when each damper is fully open, and shall energize green indicator light for each. When dampers are closed indicator lights shall de-energize.

END OF SECTION

SECTION 23 9900

TESTING, BALANCING AND COMMISSIONING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to SECTION 21 0000 – MECHANICAL SPECIAL PROVISIONS.

1.02 SCOPE

A. This section specifies the requirements and procedures for mechanical systems testing, adjusting, and balancing, and for comprehensive commissioning services for equipment and control systems in accordance with the drawings and specifications, and in accordance with the International Energy Conservation Code. Requirements include measurement and establishment of the fluid quantities and temperatures of the mechanical systems as required to meet design requirements as described in the plans, schedules and specifications, as well as control system verification, and recording and reporting the results.

B. Total system balance shall be performed by “Engineered Air Balance, Inc.”, “Delta-T, Inc.”, or “Air Balancing Company, Inc.”, under an Independent Test and Balance “TAB” Subcontract directly with the General Contractor. Work shall include all labor, instruments, tools and services required to carry out testing, adjusting & balancing and control system verification.

C. Systems to be tested, adjusted, and balanced include:

1. Unitary heating and air conditioning systems
2. Supply air distribution systems
3. Ventilation systems
4. Exhaust air systems
5. Temperature control system verification
6. DDC energy management system commissioning & verification

1.03 QUALIFICATIONS

A. The TAB Agency shall be certified by the Associated Air Balance Council (AABC), and all work shall be performed by qualified technicians under the direct supervision of an AABC Certified Registered Professional Engineer, as selected by the General Contractor based on demonstrated competence and qualifications to perform services in accordance with the Professional Services Procurement Act of Texas.

B. The TAB Agency shall provide all testing, balancing and commissioning services under a TAB Subcontract directly with the General Contractor.

C. The TAB Agency shall have operated a minimum of five (5) years under its current firm name, and shall be able to prove considerable experience on jobs of similar nature and size that were completed to the satisfaction of the respective owners. The TAB Agency's present position both financially and in terms of qualified personnel shall be secure and sufficient to complete this project to the full satisfaction of the Owner and Architect.

D. All TAB Engineers and Technicians assigned to carry out the services for this project shall have been permanent, full-time employees of the Agency for a minimum of six (6) months prior to working on this specific project.

1.04 REFERENCE STANDARDS

A. POPS No. 3-8060-1, Air Conditioning and Exhaust Ductwork

B. Associated Air Balance Council "National Standards", latest edition.

1.05 PERFORMANCE

A. Total system balance and Functional Performance Commissioning Services (per IECC) shall be performed under an independent Test & Balance (TAB) Sub-Contract as part of this contract. The TAB Agency shall be certified by the Associated Air Balance Council (AABC) and all work shall be performed by qualified technicians under the direct supervision of an AABC Certified Registered Professional Engineer.

B. Total system balance shall be performed in accordance with the latest edition of the AABC National Standards for Total System Balance, and in accordance with the scope of work specified herein.

C. Functional Performance Testing and Commissioning shall be performed in accordance with the International Energy Conservation Code (IECC), applicable version, and in accordance with the scope of work specified herein.

D. Total system balance and Commissioning shall not begin until systems are complete and functional.

E. Upon the completion of the work, the Test and Balance Agency shall submit four (4) copies of the complete Test, Balance & Commissioning Report.

F. One agency shall be responsible for all phases of total system balance and functional performance commissioning.

G. The Test and Balance Agency shall permanently mark the settings of all valves, dampers, and other adjustment devices in a manner that will allow the settings to be restored. If a balancing device is provided with a memory stop, it shall be set and locked.

1.06 SUBMITTALS

A. The Test and Balance Agency shall submit to the Owner's Representative:

1. Name and biography of TAB Engineer and all technicians to this project
2. Detailed procedures
3. Agenda
4. Report forms
5. Project Performance Guaranty

B. Submittal shall include Commissioning Plan in accordance with the IECC, to include:
1. List of equipment and systems to be tested by type.
2. Outline description of testing and commissioning activities to be performed for each equipment and system.
3. Functions to be tested including calibrations and economizer controls.
4. Summer/Winter Testing.
5. Criteria for measuring performance.

C. An approved copy of each of the above will be returned to the Test and Balance Agency before total system balance and commissioning is begun.

1.07 WORK OF OTHER TRADES

A. The Contractor shall provide the Test and Balance Agency with one (1) set of the following documents:

1. Within thirty (30) days after approved selection of the Test and Balance Agency:
   a. Contract drawings
   b. Applicable specifications
   c. Addenda

2. As issued:
   a. Change orders

3. Within thirty (30) days after approval of the below items:
   a. Approved shop drawings
   b. Approved equipment manufacturer's submittal data
   c. Approved temperature control drawings and DDC/EMS drawings and submittal data
   d. Approved control and communications diagrams, hardware and software descriptions, sequences of operations, setpoints and operating ranges

B. The Test and Balance Agency shall also be provided with:

1. Reasonable time, as determined by the Test and Balance Agency, to complete Test and Balance prior to the specified completion date.
2. Completely operable systems
3. The right to adjust the systems
4. Access to system components
5. Master keys if the building is occupied
6. Secure storage space for tools and instruments

C. The Mechanical and Control Contractors shall be responsible for start-up and operation of systems as required to accommodate total system balance. Start-up shall include the following:

1. All equipment operable in safe and normal condition
2. Temperature control systems installed complete and operable
3. Proper overload protection and safety controls in place for electrical equipment
4. Air systems
    a. Final filters clean and in place. If conditions warrant, the Contractor shall install temporary media in addition to the final filters.
    b. Duct systems clean of debris
    c. Correct fan rotation
    d. Control dampers in place and checked for tight closure and free smooth operation
    e. Fire and volume dampers in place and open
    f. Coil fins cleaned and combed
    g. Access doors closed and duct end caps in place
    h. All outlets installed and connected
5. Control systems
    a. All temperature control systems installed and operable
    b. All operating sequences functional, and all graphics, schedules, setpoints, parameters, etc., established
    c. All devices calibrated and safeties in place

D. The Control Contractor shall provide technical support including technicians, hardware and software, etc., as required to assist the TAB Agency to carry out complete control system verification.

E. During the course of test, balance and commissioning services, and following the TAB & Commissioning Report, the applicable Contractor shall make all corrections to the installed system arrangements that are determined by the TAB Agency to be deficient or otherwise unable to achieve design conditions, at no additional cost to the Owner. Such corrective measures may include installation of missing valves, dampers and adjustment devices, replacement of belts, sheaves, motors and dampers, elimination of air and unit noise, thermostat calibration, sealing air leaks, adjustment and/or software and hardware corrections to the DDC/EMS, etc.

F. The Contractor shall obtain and organize final construction documentation to be submitted to the Owner's Representative within 90 days after Substantial Completion in accordance with the IECC, to include complete drawing and specification Construction Documents, all mechanical & lighting submittal data, shop drawings and O&M manuals, and final TAB & Commissioning Reports.

PART 2 – PRODUCTS (NOT USED)

PART 3 - INSTALLATION

3.01 GENERAL REQUIREMENTS

A. The TAB Agency shall conduct pre-construction review of plans and specifications, and on-site mechanical construction reviews during construction.

B. The TAB Agency shall review all HVAC & domestic hot water shop drawings and submittal data, and shall review temperature control diagrams, operating sequences, parameters, etc., as they relate to testing and balancing services and control system commissioning verification, for conformity to design requirements.

C. The Test and Balance Agency shall cooperate with the Owner's Representative, Architect and all Contractors to perform the work in such a manner as to meet the job schedule, providing that sufficient lead time for Test and Balance has been allowed.

D. At the completion of installation but prior to testing, balancing and commissioning services, the Test and Balance Agency shall perform an installation pre-test inspection of all equipment and systems, and shall furnish written installation deficiency reports to the General Contractor and Architect/Engineer. Installation inspection reports shall be organized and submitted under Preliminary TAB Report and Preliminary Commissioning Report. Inspection reports shall include verification of proper operating condition of equipment and systems, to include the following:

- Proper installation of valves, dampers and adjustment devices
- General condition of equipment and components
- Ducts connected and sealed
- Insulation installed
- General wiring connections and control components installed and functional including:
  - Unit controllers and processing boards
  - Transformers and relays
  - Starter contacts and H-O-A switches
  - Sensors installed, functional and calibrated
  - Control terminals and wiring connections
  - Control damper and valve operators
- Control distribution wiring properly harnessed and supported in building and at each unit
- Controllers and devices installed in NEMA rated panel enclosures suitable to the environment
- Control point contacts properly numbered and labeled at each unit enclosure
- Controllers, devices and panels located in secured locations with proper service access
- Control boxes and conduit installed at concealed and exposed locations

Appropriate contractors shall immediately make corrections to all deficiencies reported with sufficient time to allow the Test & Balance Agency to carry out his work.

E. The Test and Balance Agency shall verify proper equipment and system operation, and shall test and adjust the completed systems as required to produce specified water and air quantities and temperatures, including adjustment of fan speeds, and setting of balance valves, dampers and adjustment devices at all piping, duct branches and units, and verification of proper DDC system control.

F. Testing and adjusting of water distribution systems shall be by means of control and balance valves, with memory stops set and marked. Service and isolation valves shall be set in fully open position, and shall not be used as the means for balancing to design water flow rates.

G. Adjustment and balancing of air distribution systems shall be accomplished by means of fan speed adjustment to total design air flows, followed by dampers and adjustment devices at units and/or ductwork branch ducts and takeoffs to individual air devices and terminals. Volume dampers at all air devices shall be set in fully open position, and shall not be used as the primary means for balancing to design air flow rates.

1. Fan speed adjustment for total design air flows shall include replacement of fan drives (belts and sheaves) provided by the Mechanical Contractor, should such be required.

2. Should total system air flows exceed design by 25% or less with fan speeds adjusted to extreme position, design air flows may be balanced by means of ductwork dampers in lieu of replacement of fan drives.

H. The Test and Balance Agency shall leave all system components in proper working order, such as:

1. Replace belt guards
2. Close access doors
3. Close doors to electrical switch boxes
4. Restore thermostats to specified settings

I. The Test and Balance Agency shall perform complete commissioning verification of each equipment and system for proper unit and system control operation, temperature control, sensor calibrations, measured conditions, and DDC/EMS control, as specified herein.

J. All result data shall be recorded, organized and submitted in a bound report under Final TAB Report and Final Commissioning Report, as specified herein.

K. All recorded data shall represent a true, actually measured, or observed condition.

L. Any abnormal conditions in the mechanical systems or conditions which prevent total system balance, as observed by the Test and Balance Agency, shall be reported as quickly as possible to the A/E and Contractor.

M. If a system cannot be properly balanced, it shall be reported by the Test and Balance Agency as soon as observed.

N. Should additional installed balancing devices be required, the Test and Balance Agency shall bring it to the attention of the A/E and Contractor.

3.02 TAB PROCEDURES TO BE PERFORMED

A. The TAB Agency shall test, adjust and balance all HVAC systems to meet design conditions in order to optimize temperature and humidity, air flow, water flow and noise conditions in the conditioned spaces. TAB services shall include, but not necessarily be limited to the following:

1. Air Conditioning Units
   a. Verify that the outside, return and relief air dampers move freely and are under proper control operation.
   b. Verify that filters are clean.
   c. Verify correct fan rotation.
   d. Verify proper belt tension and proper alignment of fan and motor sheaves.
   e. Verify that all unit safeties are operational (firestat, smoke detector, gas safeties, etc.).
   f. Verify correct size and rating of motor overload protection.

g. Verify fan motor is not overloaded; i.e., amperage readings do not exceed motor nameplate rating.
h. Measure, adjust and record total supply air, return air and ventilation air to design flow rates. Quantities shall be determined by duct traverse and confirmed by temperature readings of outside air, return air and mixed air temperatures compared against total unit air flow rate.
i. For staged units, supply air flow rates shall be set and recorded for each stage as scheduled.
j. If air flow rate is less than design and motor capacity is available, adjust fan to design cfms. If new sheave or sheaves and belts are required, data will be submitted to Contractor.
k. Test and adjust the minimum outside air and return air cfm relationship to design.
l. Measure and record air temperatures entering and leaving each coil and heater, as well as for supply air, return air, outside air, and room air.
m. Verify proper control and damper operation of outside air dampers.
n. Verify proper economizer ventilation operation.
o. Verify all temperature control devices are set and calibrated at design setpoint.

2. Supply/Vent/Exhaust Fans:
   a. Verify correct fan rotation.
   b. Verify proper belt tension and that fan and motor sheaves are properly aligned.
   c. Verify all safeties and interlocks are operational.
   d. Verify correct size and rating of motor overload protection.
   e. Verify fan motor is not overloaded; i.e., amperage readings do not exceed nameplate rating.
   f. Measure, adjust and record total air to design flow rate via duct traverse.
   g. If air flow rate is less than design and motor capacity is available, adjust fan to design cfm. If new sheave or sheaves and belts are required, data shall be submitted to Contractor.

3. Air Terminals:
   a. Determine sequence of operation from the specifications and verify that all control devices are installed and operational.
   b. Set primary air volumes (minimum and maximum).
   c. Balance air distribution system (see Air Distribution Systems).
   d. Measure, adjust and record plan cfm to design flow rates.
   e. Test and verify terminal box sequence of operation to insure specified control sequence.
   f. Check calibration of temperature controller.

4. Air Distribution Systems:
   a. Primary balancing of air flow rates serving all air distribution devices shall be through adjustment of ductwork dampers (i.e., splitter dampers, takeoff dampers, deflector vanes, etc.). Balancing of volume dampers at air devices themselves shall be limited to fine-tuning adjustment only.
   b. Preset all distribution volume dampers in the 100% open position.
   c. Verify properly distributed air pattern at air devices.
   d. Measure and record air flow rates at all air devices served by their source (air handling unit, A/C unit, exhaust fan, etc.).
   e. Balance distribution system for all air devices proportional to design cfm.

f. Adjust source to design cfm.
g. Verify that all air devices are within +/-10% of design.

B. The TAB Agency shall perform a complete functional performance testing & commissioning verification of the building DDC and Energy Management System (EMS). Testing and verification shall include all HVAC controls, DDC control modules, operator's workstation, sensors, operators, sequences, etc. The tests shall include verification that commands introduced at the EMS console actually occur and temperatures, pressures, etc. indicated at the EMS console correlate with actual independent measurements at the sensing points. Commissioning services shall include, but not necessarily be limited to the following verification items:

1. Air Conditioning Systems:
   a. All setpoints and control settings are established.
   b. First and second stage cooling cycles per temperature setpoints – occupied.
   c. First and second stage heating cycles per temperature setpoints – occupied.
   d. First and second stage cooling cycles per temperature setpoints – unoccupied.
   e. First and second stage heating cycles per temperature setpoints – unoccupied.
   f. Unit dehumidification cycles & operates HGRT per humidity setpoint (if provided).
      1) Humidity control locked out during heating mode.
   g. O.A. damper initiates with unit supply fan.
   h. O.A. dampers remain closed during unoccupied setback mode.
   i. O.A. dampers modulate from scheduled position down to 5% total air in response to room CO2 control.
   j. Economizer initiates per R.A. enthalpy setpoint (temperature, humidity).
   k. Economizer dampers modulate per mixed air temperature setpoint.
   l. Operable time delay on compressors.
   m. DDC signals compared against actual measurements for all sensing points:
      1) Room temperature
      2) Room humidity
      3) Room CO2 (if provided)
      4) Supply air temperature
      5) Outside air temperature
      6) Outside air humidity
   n. DDC status for unit and fan compared against actual unit operation.
   o. Actual unit operating mode for occupied and unoccupied setback as scheduled.

2. Exhaust/Ventilation Systems:
   a. Fan operation initiates as scheduled for occupied and unoccupied setback modes.
   b. DDC fan status compared with actual unit operation.
   c. Fan cycles per thermostat setpoint (if provided).
   d. Fan VFD modulates per static pressure setpoint (if provided).
   e. Firestats installed and functional.

3. Recirculated Domestic Hot Water Systems:
   a. Domestic hot water circulating pump is initiated as scheduled under occupied and unoccupied modes.
   b. Hot water pump cycles per HW return water temperature setpoint.

4. Air Terminals:
   a. Primary air damper modulates per room temperature setpoint – cooling.

b. Primary air damper modulates per room temperature setpoint – heating

5. Miscellaneous:
   a. DDC temperature alarms initiated per freezer/cooler setpoints, high and low.

6. EMS Operator Interface:
   a. All building, zone, system, and equipment graphical displays configured, each with applicable dynamic sensing points, setpoint adjustments, enable/disable switches, etc., all labeled with proper units and point names, and organized with menu-based web links as specified.
   b. Global, zone and individual equipment window displays included with applicable setpoints and point monitoring.
   c. Windows-based and web-based configuration functional with proper communication of all points.
   d. Password-protected access.
   e. Back-up phone modem communication configured and functional.
   f. Calendar-based operating schedules established for occupied mode, unoccupied setback mode, and special event mode.
   g. Status and alarm indication established for all applicable sensing and monitoring points, including text alarms displayed and reported for “off normal” conditions.

C. All local temperature controls shall be verified for proper control operation and calibration. The Contractor shall be advised of any devices out of calibration or inoperative.

D. All TAB instruments used for testing and measurement shall have been calibrated within six (6) months prior to starting date of TAB services. Calibration of all instruments shall be maintained throughout the TAB services.

E. Any item identified by the TAB Agency in need of correction and having been corrected by the Contractor shall be retested and rebalanced to verify proper operation.

F. If comfort and required conditions are not being maintained after testing, balancing and control verification to design conditions, the HVAC system shall be rebalanced and/or reset within the limitations of the equipment installed to obtain comfort and/or required conditions. Actual conditions may vary from initial design criteria, which could include, but not be limited to, general construction, mechanical and control installations, actual occupancy conditions, etc. It is the intent of this specification that proper capacity of the equipment installed be utilized to compensate for these variations to obtain comfort and/or required conditions. If comfort and/or required conditions cannot be obtained, the TAB Agency shall report specific and relevant data regarding the problem condition.

G. The TAB Agency shall conduct an inspection of the completed facility during the opposite season from that in which the initial balancing was made, and at that time make any necessary modifications to the initial adjustment required to produce optimum operation of systems and components to produce the proper conditions in each conditioned space. The opposite season inspection that be coordinated with the Architect and Owner. This inspection shall be documented with a supplemental report containing any pertinent data and information regarding any modified balance.

3.03 TAB & COMMISSIONING REPORT

A. At the completion of testing and balancing services, the TAB Agency shall prepare and submit four (4) copies of the Testing and Balancing Report, which shall include all measured and recorded data of the HVAC systems. The TAB Report shall reflect actual final conditions, and shall include, but not necessarily be limited to the following:

1. Title
2. Index

3. Preface: General description of the system with an outline of modes of operation, unusual operating conditions, any deficiencies not corrected, and suggested troubleshooting procedures.

4. A list of instruments used by type, model, range and calibration date.

5. Air Conditioning Units:
   a. Manufacturer, model, size and serial number
   b. Design and actual cfm (supply, return, and outside air), for each stage.
   c. Design and actual rpm
   d. Design and actual air temperatures entering and leaving each coil and heater, as well as supply air, return air, outside air, and room air
   e. Static pressure entering and leaving filters, coils and fans
   f. Motor nameplate data, starter data and overload protection size and rating
   g. Actual motor amperage and voltage (all phases)
   h. Filter: Type, size and quantity
   i. Operating status of dampers, safety and temperature controls
   j. For staged units, operation of unit staging and fan airflow staging for cooling and heating.
   k. Operation of unit staging and hot gas reheat for dehumidification control.
   l. Operational status of ventilation control, CO2 control and economizer operation

6. Supply/Vent/Exhaust Fans:
   a. Manufacturer, model and size
   b. Design and actual cfm
   c. Design and actual rpm
   d. Design and actual static pressure
   e. Motor nameplate data, motor starter data and overload protection size and rating
   f. Actual motor amperage and voltage (all phases)

7. Air Terminals:
   a. Manufacturer, model and size
   b. Location
   c. Design and actual primary air cfm (maximum and minimum)

8. Air Distribution Devices:
   a. Manufacturer, model and size
   b. Location
   c. Design and actual cfm

B. At the completion of commissioning services, the TAB Agency shall prepare and submit the Final Commissioning Report of all HVAC and domestic hot water equipment & control systems, and DDC & EMS systems, to accompany the Final TAB Report. Functional performance testing and verification items to be reported shall include, but not necessarily limited to the following:

1. Air Conditioning Systems:
   a. Record all DDC setpoints and control settings established.
   b. Record staging of heating and cooling in response to temperature setpoints – occupied.
   c. Record staging of heating and cooling in response to temperature setpoints – unoccupied.
   d. Record staging of dehumidification, as well as heating lockout control (if provided).
   e. Record each supply fan mode in response to settings.
   f. Record operation of O.A. dampers with unit supply fan to scheduled ventilation.
   g. Record modulation of O.A. dampers based on room CO2 control.
   h. Record outside air enthalpy economizer initiates per RA enthalpy setpoint.
   i. Record economizer damper modulation per mixed air temperature setpoint.
   j. Record outside air damper interlock with unit supply fan, as well as lockout during unoccupied setback mode.
   k. Record DDC signals against actual independent measurements of all sensing points.
   l. Record operational response to scheduled control operation and unit status.

2. Exhaust/Ventilation Systems:
   a. Record fan operation in response to scheduled control and unit status.
   b. Record fan staging per thermostat setpoint (if provided).
   c. Record modulation of fan VFD per static pressure setpoint (if provided).

3. Air Terminals:
   a. Record primary air control damper modulation in response to room cooling setpoint.
   b. Record primary air control damper modulation in response to room heating setpoint.

4. Recirculated Domestic Hot Water Systems:
   a. Record operational response of hot water circulating pump per scheduled control.
   b. Record cycling of hot water circulating pump per HW temperature setpoint.

5. EMS Operator Interface:
   a. Record completion of all graphical displays at each level with proper inclusion of monitoring and control points, and with appropriate links and menu structures.
   b. Record functional Ethernet communication of all control functions, as well as backup phone modem communication.
   c. Record all equipment operating schedules established.

6. Include a narrative for each system type describing proper control and operating sequences, and recommended setpoints.

3.04 REPORT VERIFICATION & OWNER INSTRUCTIONS

A. Owner's Representative will witness any tests which are of special concern to the Owner.

B. Owner's Representative will select at random 10% of individual readings on the balance report. These will be retested and witnessed by the Owner's Representatives, using the original test instrumentation.

1. Deviation shall not exceed 10% from the Reported Data.

2. A failure of more than 10% of the selected items shall result in the failure of the entire Field Verification Procedure.

C. Upon request, the TAB Agency shall provide on-site instruction to the Owner’s operating personnel regarding systems operation, unusual operating conditions, and system troubleshooting procedures.

3.05 GUARANTEE

A. The TAB Agency shall guarantee all services for twelve (12) months following project completion and building occupancy against incomplete or defective workmanship, incorrect test results, and/or system imbalances.

END OF SECTION

SECTION 26 0100

ELECTRICAL SPECIAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED CONDITIONS

A. The General Conditions and any Supplementary or Special Conditions or Provisions which are part of the Contract Documents are a part of this Division to the same extent as if written here in full, and the Contractor shall observe all the requirements thereof insofar as they are applicable to his work.

B. **Tornado Shelter**: All products, materials, and installation of electrical work located within the Tornado Shelter shall comply with the requirements under Section 01 1400 – Work Restrictions. This shall include, but not be limited to, anchorage of any products and systems, fire rating requirements, penetration sizes through the structure, support of distribution systems, and location of components in or near the baffling chambers or ventilation openings.

C. The above Conditions shall take precedence over these Special Provisions where in conflict.

1.02 DEFINITIONS

In addition to the Supplementary General Conditions, the following definitions shall apply to this DIVISION.

A. "Contractor" - Refers to the Contractor or Contractors for Electrical Contract Work.

B. "Subcontractor" - Refers to a Subcontractor to whom the Contractor has awarded a defined portion of the Electrical Contract Work.

1.03 CONTRACTOR QUALIFICATIONS

A. Contractor shall be able to prove considerable experience on jobs of similar nature and size that were completed to the satisfaction of the respective Owners and Architects, and that he is in position at present, both financially and in terms of qualified personnel, to complete this project to the full satisfaction of the Owner and Architect. Failure to qualify will be considered adequate cause for rejection of bid.

B. The Electrical Contractor or Subcontractor shall possess a current Master Electrician's License to perform such work issued by a legally incorporated city in the State of Texas for which a written examination is required.

C. The organization which sells, services, installs or maintains fire detection and alarm devices shall possess a valid Certificate of Registration from the State Board of Insurance of Texas and must have a licensed superintendent engaged in the work at all times that this work is being performed.

1.04 BIDS

A. Submission of a bid guarantees complete understanding of the extent and character of the work involved, including site conditions, working conditions and the material and labor required as described on the plans and/or specifications or which may be fairly implied as essential for a complete installation.

B. Bids shall be based on specified and/or pre-approved substitutions only.

1.05 INSPECTION OF SITE

All Contractors submitting proposals for this work shall first make an on-the-spot examination of the site, and all conditions thereon and/or therein. All proposals shall take into consideration such conditions as may affect the work under the respective contract. Submission of a bid will be taken as evidence that this inspection has been made.

1.06 LOCAL CUSTOMS

Contractor shall comply with local customs as to which particular trade shall install any part or parts of any work or equipment shown or specified, and shall plan and execute his work in this regard so as not to interfere with other Contractors on this project.

1.07 DRAWINGS

A. Drawings numbered with the prefix “P”, "M", "E", “FP” and "MEP" show the extent of the work contemplated.

B. The general construction plans of the building and specifications for all trades are on file in the office of the Architect, and shall be inspected by all bidders.

C. Exceptions and inconsistencies in plans and specifications shall be brought to the attention of the Architect before the contract is signed. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus.

D. The plans are intended to show the general arrangement and the extent of the work contemplated. The exact location and arrangement of all parts shall be determined after equipment has been approved by the Architect as the work progresses, to conform in the best possible manner with the surroundings and as directed by the Architect.

E. Figured dimensions shall be followed without regard to scale - where no figures or notations are given, the plans shall be followed.

F. In general, the highest rated breakers, transformers, panel bus, switches, etc., on a given circuit shall dictate the required size for the entire circuit (i.e., a 225 amp bus would require a feeder and transformer designed for 225 amp loads, etc.)

1.08 SYMBOLS

Symbols for the various outlets, lighting, and related systems are noted on the plans, and shall be strictly adhered to in connection with all work. Should the Contractor be in doubt regarding the real meaning and intent of the various symbols used, he shall confer with the Architect for interpretation, whose decision shall be final.

1.09 ABBREVIATIONS

Abbreviations are used throughout the specifications and drawings as needed. Generally, these abbreviations are well known in the industry and are generally described on the drawings. Should the Contractor be in doubt regarding the real meaning and intent of the various abbreviations used, he shall confer with the Architect for interpretation whose decision shall be final.

1.10 SUBSTITUTIONS

A. Contractor, if desirous of using equipment and/or materials other than that specifically called for in the drawings and specifications, shall adhere to the substitution procedure specified under Section 01 6000 Product Requirements of these specifications.

1. Such items as are considered by the Engineer to be generally acceptable shall then be submitted for final review according to the procedures outlined for all equipment under SHOP DRAWINGS AND SUBMITTAL DATA.

2. Such items as are considered by the Engineer to be generally not acceptable shall be prohibited from further consideration for this project.

1.11 SHOP DRAWINGS AND SUBMITTAL DATA

A. Contractor shall furnish detailed shop drawings, catalogue and submittal data in accordance with said procedure as specified under Section 01 3000 Administrative Requirements.

B. Shop drawing and/or catalogue data shall be submitted on the following items, but shall not be limited to these items:

1. Fire Alarm System
2. Switchboards
3. Panelboards
4. Transformers
5. Power Factor Correction Equipment
6. Disconnect Switches
7. Surge Protection Devices
8. Wiring Devices
9. Lighting Fixtures
10. Lighting Control System
11. Fuses
12. Photocells

C. All shop drawings, product data and samples submitted by the Contractor shall illustrate details of work, equipment, materials, products, systems, designs or workmanship that the Contractor intends to use in order to comply with the design concept established in the contract documents. The Engineer's review of these submittals is only for the limited purpose of checking the same for conformity with the design concept of the work as established in the contract documents, and is not intended to be for the purpose of determining the accuracy of other matters that may be contained in such submittals, including but not limited to such matters as dimensions, quantities, performance of equipment and systems designed by the Contractor, Contractor-furnished engineering and design, construction means, methods, techniques, sequences, procedures or safety precautions, the correctness of which as set forth in the contract documents or submittal shall be the sole responsibility of the Contractor. The Architect shall undertake its review with reasonable promptness so as to cause no delay. The Architect's review of a specific item shall not indicate approval of an assembly of which the item is a component or in which it functions.

1.12 EQUIPMENT LIST, PROGRESS SCHEDULES, ESTIMATES

A. Prepare equipment list tabulating each item of material and equipment required and giving the date upon which the order is placed, the date of submittal of shop drawings, and the anticipated date of delivery of the item.

B. Prepare and furnish to the Architect a "Construction Progress Schedule". This schedule shall indicate in form satisfactory to the Architect the proposed dates of commencement and completion of the entire work.

1.13 ORDINANCES, PERMITS, AND CERTIFICATES

A. All labor and materials shall be in strict conformance with the most recently revised editions and amendments of all applicable laws, rules, and recommendations of the National Fire Protection Association, municipal and state codes and regulations, local electric and telephone companies, National Electrical Code, or any other authorities that may have lawful jurisdiction pertaining to the work. The cost of all work required to comply with the requirements of these authorities shall be included in the original proposal and shall be performed without additional cost to the Owner.

B. Contractor shall procure all necessary permits, licenses, or inspections to carry out his work and shall pay the lawful fees therefore. Contractor shall procure and pay for all necessary certificates of approval, which must be delivered to the Architect before final acceptance of the work.

C. The Contractor shall arrange with authorities and utility companies for service connections, verifying locations and arrangement and paying all charges, including arrangements for cutting and patching pavements, sidewalks, etc.

D. Where the Contract Documents are in excess of the requirements of the above regulations and are permitted under these regulations, the Contract Documents shall be followed.

E. Work shall be installed as indicated on the drawings, unless drawings and/or materials conflict with Code requirements governing, in which case, the Code shall be followed without additional charge to the Owner.

F. Electrical Contractors, including Subcontractors (fire alarm, public address, etc.) shall have a working knowledge of local city codes including local fire marshal requirements prior to bidding the project. Additional items required by local city codes shall be furnished and installed at no additional cost to the contract.

1.14 UTILITIES AND EXISTING WORK

The locations, sizes, types, and depths of various existing or proposed new piping and/or utility mains, and the locations, sizes, types, and characteristics of various existing or proposed new electric and telephone service feeders and facilities are shown in accordance with the best information available. Data shown is offered as an estimating guide without guarantee of accuracy. Each bidder shall make complete investigations of the site, and shall check and verify all data given him before entering a bid. Full responsibility for all complications arising from unverified data shall rest with the Contractor or Contractors involved.

1.15 PROTECTION OF WORK AND MATERIALS

A. All work, materials, and equipment, whether incorporated in the building or not, shall be protected at all times against the weather (rain, windstorms, frost, ice, or heat) so as to maintain them free from injury or damage. At the end of each day's work, all work likely to be damaged shall be covered.

B. Building openings shall be covered to protect the building from the weather.

C. Finished floors, step treads, Owner's equipment, and all finished surfaces (exterior or interior), shall be protected against damage by workmen or equipment during the work. Wherever materials are hoisted to the roof or carried into the building, surfaces must be covered with a layer of heavy building paper.

D. Equipment shall be kept out of the weather, and shall be kept covered. Where work is to be done above equipment, the Contractor shall provide full and solid wood platforms above such equipment, to prevent its being damaged or soiled.

E. Any and all equipment, conduit, panelboards, transformers, etc., which in the opinion of the Architect becomes damaged, abused, inundated, or otherwise harmed beyond normal and minor repair, shall be replaced with new equipment or material at no additional cost to the Owner.

F. The Contractor shall be proportionately and respectively responsible for all damage done to the Owner's property or adjacent properties during the construction. The above protection shall be maintained while work is being done, and in no case shall dirt or grit be ground into floor finishes or floor coverings.

1.16 STORAGE OF MATERIALS

A. The Contractor shall be responsible for the transportation of his materials to and on the job, and shall provide space for storage of his materials and equipment at ground level. Roof surfaces shall not be used for storage of materials or equipment. The Architect prior to use of the space shall approve any storage within the building.

B. Conduit, fittings, or other material stored outside of buildings shall be set on wood or steel racks or platforms at least 12" above grade. All necessary provisions shall be made to keep water and debris away from such stored materials. Ends of conduits and valves shall be kept sealed until used.

C. Equipment subject to rusting shall be kept warehoused until just prior to setting.

1.17 LOCATION OF OUTLETS AND EQUIPMENT

A. The locations of all conduit, outlets, panelboards, etc. shown on the plans, if not specifically dimensioned are approximate only, and understood to be subject to minor revisions as may be found necessary or desirable at the time work is installed.

B. Generally, all outlets shall be properly centered in rooms, panels, and other finished work, shall not interfere with outlets or equipment of other Contractors, and shall meet the dimensioned or large-scale architectural drawings.

C. When requested by the Architect, prior to installation of equipment, changes in location up to a distance of 8'-0" shall be made by the Contractor without additional charge to the Owner.

1.18 CLEANING, TESTING, AND ADJUSTING, GENERALLY

A. The Contractor shall at his own expense, during the progress of the work, or upon its completion, make such tests of his work as hereinafter specified under the various sections, as required by the Architect and under his supervision.

B. The Contractor shall furnish all necessary labor, electricity, apparatus, etc., as required for tests. The Contractor shall take all precautions necessary to prevent damage to the building during tests, and he shall be liable and pay for all damage incurred during the tests.

C. All defects discovered by the tests shall be immediately repaired or replaced and tests conducted over until tests prove the systems are satisfactory.

D. Where specified for any individual item of electrical equipment, provide a factory authorized representative for testing and start-up of equipment, and instruction of Owner's operating personnel. Certify that including a properly executed invoice for these services or a letter from the Manufacturer has performed these services.

1.19 PAINTING, GENERALLY

Unless otherwise specified, job finish painting will be performed under the Painting Section. Equipment furnished under this Division shall be factory furnished finish. Damaged factory finish surfaces of equipment shall be restored to its original condition.

1.20 EQUIPMENT IDENTIFICATION

A. Each panelboard shall be identified with a 1/16” thick phenolic plastic "bolted on" nameplate, having white lettering on black background, which shall indicate the panel name, voltage, phase, ampacity, from where fed and conductor identification by color. For example, “Panel A 120/208, 3 PH., 4W, 225A, Fed From Panel MP; PH A – Black, PH B – Red, PH C – Blue, Neutral – White”. Letters shall be not less than 3/8" in height. Nameplates shall be bolted to the panel face. Refer to detail on the drawings.

B. Each disconnect safety switch, contactor, control relay, and similar electrical devices shall be provided with a 1/16” thick phenolic plastic nameplate, listing the name, circuit number, voltage, and phase of the equipment served. Nameplates shall be bolted to the face of the respective enclosure, and names shall correspond to those used on the drawings. Letters shall be not less than 1/4" high for equipment name and 1/8" high for other data. Refer to detail on the drawings.

C. Pull wires in empty conduits and circuits for future connection shall have nametags attached to wiring at junction boxes or where runs are terminated in panels, boxes, etc. Feeder or branch circuit numbers shall be indicated. Tags shall be made of pressure sensitive tape or embossed self-attached ribbon and all designation shall correspond to the identification on the record drawings.

D. Panelboards shall have typewritten circuit directories on card stock paper installed inside the doors under transparent cover. Circuit directories must match as-built conditions. Provide a completed as-built copy of each panelboard circuit directory with final close-out documents.

E. Service equipment shall be identified with the maximum available fault current along with the date the fault calculation was performed. Identification shall be a 1/16” thick phenolic plastic “bolted-on” nameplate, having white lettering on black background indicating fault current and date, i.e., “Available Fault Current: 15,000 Amps, Installation Date: 06/15/2016”. Letters shall not be less than 3/8” in height. Nameplate shall be bolted to the face of the equipment. Fault calculation may be verified by Engineer if Contractor provides the following information:

1. Utility transformer kVA and percent impedance.
2. Approximate conductor length from utility transformer to service equipment.
3. Material, quantity and size of service conductors and conduit material.

1.21 OPERATING INSTRUCTIONS

A. At the completion of the work, the Contractor shall prepare deliver complete operating instructions and maintenance brochures in accordance with procedures specified under Section 01 7800 Close-Out Submittals, included in these specifications.

B. The project will not receive final acceptance until the Owner has received operating instructions and maintenance brochures.

1.22 ROOF PENETRATIONS

All roof penetrations shall be provided with lead base and counterflashing arranged to provide a weathertight installation.

1.23 RECORD DRAWINGS

A. The Contractor shall refer to Architectural Specifications for submission requirements of record drawings and all close-out submittals. As the work progresses, the Contractor shall make any and all corrections clearly indicating actual changes from the original drawings. Final approval of the installations will not be given until these drawings have been received and accepted by the Architect.

B. The Electrical Drawings shall indicate clearly the depth and exact location of all outside service and branch circuit wiring.

1.24 INSTALLATION DRAWINGS

A. The Contractor shall make an installation drawing of all areas where electrical panelboards may have a space conflict due to varying dimensions of equipment between manufacturers. Drawings shall show panel locations, dimensions, etc. with proper clearances required by code. Where panels are located in rooms with mechanical equipment, all such equipment, piping, etc. shall be accounted for on the drawing. Drawings shall be submitted with panelboard or switchgear submittals. Absences of such drawings shall indicate the Contractor has reviewed all such conditions and that proper panelboard installation can be made as indicated on the drawings. Drawings shall be done before any rough-in for panelboards has been accomplished.

1.25 JOB-SITE OBSERVATIONS

A. The purpose of the job-site observation is to determine whether the Contractor is performing the work in a proper and workmanlike manner, that he is apparently installing the work in accordance with the intent of the drawings and specifications and that in the Architect and Engineer's opinion, the work is satisfactory.

B. It shall be the duty of each Contractor to personally make a special inspection trip of the whole project to assure himself that the work on the project is ready for final observation before calling upon the Architect and Engineer to make a final observation.

C. In order not to delay final acceptance of the work, each Contractor shall have all necessary bonds, guarantees, receipts, affidavits, etc., called for in the various articles of this specification, prepared and signed in advance, and together with a letter of transmittal, listing each paper included, shall deliver the same to the Architect at or before the time of said final observation. The Contractor is cautioned to check over each bond, receipt, etc., before preparing same for submission to see that the terms comply with the requirements of the specification.

D. Contractor shall provide ladders and lifts as required by the Engineer to aid in his observation.

E. If the Engineer arrives for a final job-site observation and determines that the project is not ready for final observation and has to reschedule for another date, the Contractor will be charged and shall pay $1,000.00 for each subsequent observation.

1.26 GUARANTEES

A. In addition to the guarantees on the individual items of new equipment, this Contractor shall guarantee all new and/or reworked equipment and workmanship for a period of twelve (12) months from the date of final acceptance by the Owner.

B. If within the guarantee period, such equipment or work performed under this contract is found to be defective in material or workmanship, it shall be replaced or repaired free of any additional charges.

1.27 PERFORMANCE

A. All labor, materials, apparatus, and appliances including power and control circuits, wiring, etc. essential to the complete functioning of the systems described and/or indicated herein, or which may be reasonably implied as essential whether mentioned in the Contract Drawings and Specifications or not, shall be furnished and installed by the Contractor.

B. Electrical items such as light fixtures, receptacles, motors, etc. that have no designated circuit number shall be circuited as required and connected to an appropriate circuit breaker in the nearest panelboard with compatible voltage.

C. In cases of doubt as to the Work intended, or in the event of need for explanation thereof, the Contractor shall request supplementary instructions from the Architect.

1.28 ALLOWANCES

A. Several sections of the electrical specifications call for an allowance for additional circuitry and devices. Each indicated allowance is separate from those indicated in other specification sections. These allowances are a vital part of the construction process and are required in order to have circuits for certain unknown items at the time of final design. These allowances are not to be utilized in any after-bid cost reduction proposals.

B. Allowances for additional spare (loose) circuit breakers indicated in the specifications shall be included in the panelboard submittal.

PART 2 - PRODUCTS

2.01 STANDARDS FOR MATERIALS AND EQUIPMENT

A. It is the intention of these specifications to indicate a standard of quality for all materials and equipment incorporated in this work. Manufacturer's names and catalogue numbers are used to designate the item of equipment or material as a means of establishing grade and quality. Where one or more manufacturers are named, only those named will be considered and the Contractor's bid shall be based on their products. Named manufacturers, although acceptable as manufacturers, must prove their product will perform satisfactorily and will meet all requirements, etc.

B. Where the "or approved equivalent" clause is used in these specifications, the name, or names, mentioned are to be used as a basis of quality. Other manufacturers may be used if, in the opinion of the Architect, the quality of the proposed material is equivalent to that of materials named. Such unnamed manufacturer's products will, however, be considered as substitutions and shall not be used as basis for bidding. Requests for such substitutions shall be made in writing, and require written approval of the Architect.

C. The term "no equivalent" in the specifications or on the drawings indicates that material and equipment shall be furnished exactly as specified.

D. The term "match existing" in the specifications or on the drawings indicates that material and equipment shall be exactly the same as existing, if available. If no longer manufactured, then it shall be similar in design and operation.

E. The term “no others will be considered” in the specifications or on the drawings indicates that material and equipment shall be furnished by one of the manufacturers listed and that no substitutions will be considered.

F. Basis of quality shall be interpreted to include material, workmanship, size, weight, finishes, gauges of material, appearance, performance, etc.

G. Manufacturer representation as to availability of equipment, parts and replacement and service personnel in the area, performance of past projects and quality of past submittals will be a factor in consideration of submittal.

H. All materials shall be new, unless otherwise shown or specified, and of quality grade, standard manufacture and first class in every respect. Material shall bear the label of the NFPA, NEMA, U.L., etc. where such standard has been established for the particular item of equipment used.

PART 3 - INSTALLATION

3.01 WORKMANSHIP

All workmanship shall, in all respects, be of the highest grade, and all construction shall be done according to the best practice of the trade. Work shall be done by mechanics experienced and skilled in the trade involved. All work shall be completed to the entire satisfaction of the Architect.

3.02 EQUIPMENT FURNISHED BY OTHERS

A. This Contractor shall make all electrical connections to equipment furnished under other contracts. Furnish wiring, conduit, outlet boxes, etc., as required for same throughout the building. The Contractor shall check all drawings and specifications to be informed as to the connections required. Each item shall be connected as directed by the equipment supplier.

B. This Contractor shall make all rough-in required and final connection to all equipment furnished by Owner. Each item shall be verified as to voltage, phases, amperes, kW, etc., and connected as required.

C. Contractor shall be responsible for coordination of rough-in with all equipment to be installed. Connection to all equipment shall be in accordance with equipment manufacturer's recommendations.

D. Request list from each applicable trade of all electrical consuming items being installed in the project under this contract. List shall include amps, voltage, phase, etc. of each piece of equipment or electrical device. Refer to SECTION 21 0000 - MECHANICAL SPECIAL PROVISIONS. Verify electrical service provided to each item and notify the Architect and applicable trade immediately of any discrepancies. Make reasonable adjustments to branch service sizes if required without an addition to the contract amount. Coordination shall be completed prior to finalizing all equipment and material purchases for the project that could be affected.

E. Verify and provide electrical power as required to all water heaters, water heater blowers, circulation pumps, overhead motorized doors, electric water coolers, fire/smoke dampers, etc., and make reasonable adjustments to circuits as required at no additional cost to the contract. Contractor shall allow for four (4) additional circuits for equipment that may not be identified on the drawings. This is in addition to other allowances indicated in these specifications and shall be based on 100 feet run of 3/4" conduit with two (2) #10 wire and ground.

3.03 PRECAUTION AGAINST NOISE AND VIBRATION

A. The Contractor shall take the utmost precautions in the installation of his equipment, piping, and systems to prevent noise and vibration transmission.

B. Equipment that would tend to cause noise or vibration shall be isolated to prevent noise transmission to the building or to other equipment.

C. Conduit, etc., connected to equipment shall be isolated. The Contractor shall be responsible for the prevention of noise and vibration transmission through his connections to equipment.

3.04 CUTTING AND PATCHING

A. The Contractor shall be responsible for all cutting and patching required for the proper installation of his work, and shall obtain permission from the Architect before doing any cutting. Cutting and patching shall be done in such a manner that the surrounding work will be restored to its original condition.

B. NO STRUCTURAL MEMBER MAY BE CUT WITHOUT WRITTEN PERMISSION FROM THE ARCHITECT.

C. When cutting and patching is done in occupied spaces within the building, the Contractor shall provide a dust-tight enclosure and any other necessary protection around his operation in order to protect equipment and finishes.

D. Openings cut through the roof or exterior walls shall be provided with a temporary watertight cover during construction or until equipment or repair has been made.

3.05 EXCAVATION AND BACKFILL

A. All excavation and backfill of all classes required to install work included in these sections of the specifications, shall be performed as a part of the work of this Contractor. No extra payment will be made for rock excavation. Trenches for all underground pipes shall be excavated to the required depths. The bottom of trenches shall be tamped hard and graded to secure maximum fall. Bell holes shall be excavated to assure the pipe rests for its entire length on solid ground. Trenches shall be excavated to a depth of twelve inches below the bottom of the pipe and, before laying the pipe, the space between the bottom of the conduit and the bottom surface shall be filled evenly and completely with pea gravel, 3/8" nominal aggregate, thoroughly tamped. Pipe laid in trenches dug in fill shall be supported down to load bearing undisturbed soil where possible. After the pipe has been tested and inspected, the trenches shall be filled. No rocks or foreign materials of any description shall be used in backfilling the trenches. The backfill material shall be deposited in layers at optimum moisture content and mechanically compacted to 90% of maximum density as determined in accordance with ASTM D698. The process shall be continued until trenches are backfilled. The Contractor at his expense shall haul all surplus materials from the project.

B. Where gravel streets, paved streets, parking areas, sidewalks, or any other paved, graveled or surfaced area is disturbed, cut or damaged during the installation of any underground work, the expense of repairing same in an approved manner and as required by local ordinances, suitable to the Architect shall be included under the contract.

C. Route underground lines to miss trees and bushes as required. Yards, shrubbery, planting areas disturbed for the installation of underground services shall be repaired or replaced by the Contractor subject to the approval of the Architect.

E. Trenches for conduits requiring joint makeup shall be sufficiently wide to provide working spaces.

F. Any sinking of surfaces over ditches, trenches, etc., including turf, paving, curbs, etc., during the guarantee period shall be repaired by the Contractor to the satisfaction of the Architect

G. The entire length of excavation shall be inspected with a utility detector and in the presence of Owner's maintenance personnel and representatives of gas, water and telephone utilities for existing utility locations prior to excavation and ditching. Hand-dig around all existing utility locations. Any utility thus damaged shall be restored to service in compliance to Owner's requirements at no additional cost to the contract.

H. All excavating, trenching and backfilling shall be carried out in strict accordance with OSHA Trenching Standards, Geotechnical Report and other design authorities for this project. See Structural and Civil Drawings and Specifications for additional requirements.

3.06 HEAT STRIP

A. Furnish and install heat tape on <u>all</u> exposed water lines, including heating and cooling lines, that are subject to freezing (if any).

B. Contractor shall thoroughly review the mechanical drawings to verify the extent of exterior heating and cooling water piping and determine the exact length of pipes and heat strip requirements before bidding; and include the required amount of heat strip in his bid. No additional payments will be made for unverified data.

C. Furnish and install all required thermostats, boxes, conduit, wiring, etc. for a proper heat strip installation.

D. Strip shall have Teflon insulating sheath rated at 400^{o}F and constant wattage per foot output, 120 volt input. Strip shall be rated 4 or 8 watts per foot as required for pipe size. Approved manufacturer is "Pyrotenax" Type PY, or approved equal.

E. Furnish thermostats, foil tape, tee kits, etc., as required.

F. All accessories shall be furnished by the heat strip manufacturer.

G. Install heat strip for freeze protection in strict accordance with manufacturer's instructions. Install 4 watt per foot tracing on all piping up to 3" in size. Install 8 watt per foot tracing on all piping larger than 3".

H. Furnish all project dedicated 120 volt electrical circuits required for proper heat strip operation.

3.07 PAINTING

Panelboards shall have standard factory paint and be touched up in the field to an as-new finish.

3.08 INTERFERENCES

The plans are generally diagrammatic, and the Contractor must harmonize the work of the different trades so that interference between their work and the architectural and structural work will be avoided. All piping, ductwork, and electrical raceways shall be installed as close as possible to walls, floors, columns, ceilings, and beams, and offsets or special fittings shall be installed as required to accomplish this end whether or not shown on the plans.

3.09 PRECEDENCE

A. The mechanical and electrical work shall have precedence over each other in the following sequence:

1. Soil and Waste Piping
2. Storm Drainage Piping
3. Ductwork
4. Plumbing Water Piping
5. Refrigerant Piping
6. Gas Piping
7. Electrical

3.10 EQUIPMENT MAINTENANCE SPACE

Electrical Contractor shall allow for all required maintenance clearances around each item of mechanical and/or electrical equipment and shall not install any conduit within the required maintenance spaces. Each item of mechanical equipment shall be maintainable and shall be removable without repositioning any conduits. Required mechanical maintenance spaces shall be secured from equipment manufacturer and Mechanical Contractor.

3.11 HOISTS, SCAFFOLDS, AND TOOLS

Each Contractor shall provide or arrange for his own scaffolds, hoists, derricks, tools, and labor as necessary for the complete installation of the work under his contract.

3.12 TRADE RESPONSIBILITY

Except as otherwise specifically noted, it is not the intent of this specification to establish limits of responsibility between trades as to work which may or may not be performed under a subcontract to the Contractor awarded a contract for this project. The General Contractor shall in all cases be responsible for the entire project as defined in the SUPPLEMENTAL CONDITIONS.

3.13 REQUESTS FOR INFORMATION

Requests for Information (RFI's) shall be made in strict accordance with the General Conditions of the Contract. All such requests shall clearly state the effect the proposed request will have on contract cost. No work is to be done until the RFI is executed as an approved change order. If the request indicates a proposed increase in contract cost, Contractor shall submit a detailed item-by-item cost proposal within seven (7) days of the RFI date. No cost adjustments will be considered without compliance of the above.

3.14 ELECTRONIC COPIES OF CONSTRUCTION DOCUMENTS

A. The General Contractor may request, on behalf of himself and/or the Sub-Contractors electronic copies of the various sheets of the drawings. Please refer to Architectural Specification Section 01 3300 – Submittal Procedures for information on obtaining these files.

END OF SECTION

SECTION 26 0519

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SCOPE

The work included under this section of these specifications consist of the furnishing of all material and equipment and in performing of all labor and services necessary for the complete installation of the system of conductors for power and lighting service including all related systems and accessories for the project, all as shown on the drawings and hereinafter specified.

PART 2 - PRODUCTS

2.01 WIRE AND CABLE – BUILDING

A. All wire and cable for feeders and branch circuits, unless otherwise specified shall be 600 volt thermoplastic insulated of the heat resistant (90^{O} operating temperature) and moisture-resistant THHN/THWN-2 type in wet locations and dry locations, shall conform to all of the latest requirements of the NEC, and shall meet all specifications of the ASTM. Conductors shall be soft drawn copper. Wire shall be U.L. approved.

B. Where noted “aluminum” on the drawings, feeder wire and cable shall be compact stranded aluminum alloy conductor with XLPE insulation equivalent to “General Cable” Stabiloy Type XHHW-2, rated at 90^{o} in wet and dry locations. Minimum size allowed shall be #1/0.

C. Where permitted in Paragraph 3.01, branch circuits may utilize multi-conductor metal-clad Type MC cable. Cable shall consist of Type THHN/THWN-2 copper conductors rated at 90^{o}C with green insulated grounding conductor and aluminum interlocking armor, and shall be equivalent to "Southwire" Armorlite Type MC or “AFC” MC Lite Series with solid conductors.

1. Where lighting circuits with 0-10V dimming are utilized, it is acceptable to provide MC cable with combination of power and controls conductors in single U.L. listed type MC-PCS cable equivalent to “Southwire” MC-PCS Duo or “AFC” MC Luminary Cable.

D. Conductor sizes shall be standard American Wire Gauge sizes and shall be as noted on the drawings and/or listed in the feeder schedule. All conductors shall be stranded type for conductor sizes #10 and above. Solid or stranded type is acceptable for #12 except as noted above for MC cable.

E. All sizes of wire and cable shall be factory color-coded, with a separate color for each phase, and neutral used consistently throughout. The neutral wire of all branch circuits shall have a white cover. The name of the manufacturer, insulation type, and wire size shall be clearly and permanently imprinted throughout the length of each conductor. Feeder conductors larger than No. 8 shall be color-coded by 1-1/2" color bands as manufactured by "3M Company", where factory color-coded conductors are not used.

F. Color coding shall be as follows:

120/208 Volt System	277/480 Volt System
Phase "A" – Black	Phase "A" - Brown
Phase "B" – Red	Phase "B" - Orange
Phase "C" – Blue	Phase "C" - Yellow
Neutral - White	Neutral - Gray
Grounding – Green	Grounding - Green
Isolated Ground – Green with Yellow Tracer	

E. Approved manufacturers: “AIW”, “Encore “General Cable”, “Southwire”, “AFC”, and “United Copper”.

2.02 WIRE CONNECTORS

A. Splices and joints shall be made up with "Buchanan" or "Ideal" spring-steel, screw-on type pressure connectors.

B. Bolted type connectors for feeder splices and taps shall be "Burndy" or "O.Z. Gedney".

C. No split bolt connectors will be allowed.

2.03 TERMINATORS

A. Feeder terminators shall be "Burndy" or "O.Z. Gedney" bolted pressure terminals and lugs properly sized for conductors, and of the correct type for the connection being made.

PART 3 - EXECUTION

3.01 INSTALLATION – BUILDING WIRING AND CABLE SYSTEMS

A. This Contractor shall furnish and install such wiring as is required for a complete electric wiring system for light and power, including feeders, subfeeders and branch circuits, making proper connections to switches, panelboards, motors, and controllers and to each outlet in the building.

B. Feeders shall be of sizes and types of wire as shown on the drawings, and shall be installed in conduit supported by hangers secured to structural beams and slabs. No wire shall be used for support of conduits.

C. Where practical, feeder conductors shall be continuous without splices between terminals. All conductors shall be contained in the same raceway.

D. The installation of wires and cables includes all splicing of these wires and cables to each other and connecting them to switchboards, receptacles, switches, control boxes, lighting fixtures, motors, and all other electrical apparatus installed under this contract.

E. Where stranded conductors are to be connected directly to the devices without the use of lugs, such as occurs at lighting switches and plug receptacles, the wires shall be formed into a loop around the screws.

F. Where wires and cables are connected to metallic surfaces, the coated surfaces of the metal shall be polished before installing the mechanical connector. The lacquer coating of the conduits shall be removed where a ground clamp is to be installed.

G. All 120 and 277 volt circuits require a dedicated neutral conductor.

H. All multi-wire branch circuits shall have phase and neutral conductors grouped together with cable ties in panelboard.

I. Wire counts for conduit runs are not indicated on the drawings. Contractor shall install wiring as required by Code and this specification.

J. Installation of aluminum conductors, where noted on the drawings, shall be in strict accordance with manufacturer's recommendations, including proper torque of termination lugs and utilization of proper wire sealant.

K. MC cable shall be allowed only in the following locations:

1. For light fixture whips where concealed above ceilings.
2. For lighting circuits with 0-10V dimming.
3. For wiring from branch circuit boxes above ceiling to devices directly below boxes, where concealed within walls. No horizontal cabling within walls is allowed.
4. Where new devices are to be installed in existing stud walls, utilizing cut-in junction boxes.
5. MC cable shall be installed per N.E.C. 330, and securely supported so as not resting on ceiling grid or mechanical equipment such as pipes and ducts.

3.02 INSTALLATION - SPLICES AND JOINTS

A. Connectors shall be applied in strict conformance with the manufacturer's recommendations.

B. Splices and joints shall occur only at accessible outlets or junction boxes.

C. Cover all splices and joints in the free ends of conductors with an insulation composed of material of thickness and insulation resistance equal to that on the conductors, as recommended by the wire manufacturer.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall install a complete grounding system for the following systems:

1. Power system grounding
2. Communication system grounding
3. Electrical equipment and raceway grounding and bonding

PART 2 - PRODUCTS

2.01 MANUFACTURED PRODUCTS

A. Ground Rods: Copper clad steel rods having a diameter of 3/4" and a minimum length of 10'-0".

B. Ground Cables: Stranded, bare copper of 98% conductivity. All insulated cable shall be Type THHN or THW with Class B stranding. Cable buried in direct contact with earth shall be tin-plated.

C. Ground Fittings: Fittings for bonding ground cable to the conduit shall utilize a setscrew and shall be U.L. listed for the purpose.

D. Lugs: All cable lugs shall be compression type, long barrel with two-hole tongue, and covered with heavy-duty heat or cold shrink. Lugs shall be manufactured by "T&B" or "Burndy".

E. Connectors: All connectors shall be U.L. listed for the purpose.

F. Bus Bars: Unless otherwise indicated in Division 27 or "T" Series Drawings, all bus bars shall be made from copper flat stock with pre-punched holes as detailed on the construction drawings. All bus bars shall be mounted on 3" Glastic type standoff insulators. Bus bars shall have 3/8" labeled Plexiglas covers mounted on the front of the bars with 3" Glastic insulator supports.

2.02 GROUNDING SYSTEM

A. Provide a grounding system that includes all connections. Provide testing of ground rods, ground cables, ground busses, conduits, fittings, anchor supports, exothermic process materials and equipment and other materials as required for a complete installation.

B. Provide all grounding (cables and devices) shown and/or specified in Division 27 of these specifications identified as to be provided by this Contractor.

C. Provide a 1/0 grounding conductor connecting all “IDF” and “MDF” room ground bars to nearest substantial steel structural member in the building in addition to ground bus in nearest technology power “T-___” Series panelboard (panel serving technology circuits in room).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Grounding electrical work in accordance with NEC Article 250, this specification and local codes.

B. Install ground cables in conduits above grade or directly buried in earth to a depth of not less than 30" below grade. Installation shall provide sufficient mechanical protection so as not to break ground cables or connections.

C. Install ground cables continuously between connections. Splices shall not be permitted, except where indicated on the plans. Where ground cables pass through floor slabs, buildings, etc., and when not in metallic enclosures, provide a sleeve of approved, non-metallic materials.

D. Install a green colored, equipment-grounding conductor in all raceways. Size conductors in accordance with NEC Article 250. Grounding conductors shall be connected to ground busses in panels, not the neutral bar.

E. All metal boxes shall be grounded. Ground pigtails shall be installed in each box. At each convenience outlet, install a grounding clip attached to the outlet box and leave a sufficient length of #12 wire with green colored insulation to connect to the grounding terminal at the receptacle. This clip may be deleted if an automatic grounding receptacle meeting NEC Article 250-146(b) is used and if approved by the local inspector.

F. At the service entrance equipment, bond the utility neutral, building neutral and building ground conductor to a common ground bus (or ground lug). Bond the ground bus to the building steel, metal underground water pipe, one or more 10' ground rods along with a concrete-encased electrode. The concrete-encased electrode shall consist of a twenty-foot (20') 1/2" rebar or #4 AWG copper conductor installed a minimum of two-inches (2") from the bottom footing. This ground shall be inspected by the City at the time of the foundation inspection. Install the grounding conductor in exposed conduit and make connections readily accessible for inspection. The point of connection to the water service shall be no more than 5’ from the building entrance.

G. Provide a ground bus at point of service entrance on wall adjacent to main panel or switchboard and connect it to the building grounding electrode. Bus shall be utilized for grounding electrode connections described by Paragraph F. above. Minimum size shall be #4/0 AWG unless otherwise noted.

H. All exposed non-current carrying metallic parts of electrical and mechanical equipment, including metallic raceway systems, piping, steel columns, and other structural members and neutral conductors of the wiring system shall be grounded as required by the National Electrical Code and this specification. The grounding conductor shall be green color-coded or bare, sized as specified or indicated, and if not specified or indicated, it shall be in accordance with Article 250 of the National Electrical Code. Grounding lugs, connectors and other components shall comply with the National Electrical Code.

I. The grounding electrode conductor shall be bare copper unless otherwise indicated and shall be sized as shown on the contract drawings, or where not shown, shall be sized in accordance with the applicable part of the National Electrical Code, except that it shall not be sized smaller than No. 6 AWG. This conductor shall be connected to the grounded conductor (neutral) in the service disconnecting means and shall extend to the grounding electrode directly, in one continuous run. Where installed in metal conduit that is not electrically continuous to the grounding electrode, the grounding electrode shall be bonded to the open ends of the conduit.

J. All cable lugs shall be installed with 15-ton crimp tool or as specified by manufacturer. Crimps shall be made with a hexagonal or elliptical circumferential die. No-ox inhibitor shall be applied to the connection point. Paint shall be scraped from painted surfaces and No-ox shall be applied.

K. All bus bars shall be insulated from the wall or floor with 3" Glastic type insulators and shall be 3/8" Plexiglas covers mounted on the front of bars using 3" Glastic insulator supports. Permanent identification shall be stenciled on the Plexiglas cover. Bus bar shall be thoroughly cleaned prior to making any connection using No-ox. All bus bars supported on the wall shall be installed so there is no tension on the bus bar. Also, where there are more than six (6) terminations onto a wall-mounted bus bar, bus bar shall be mounted on unistrut braced securely onto wall.

L. Install a #4/0 ground jumper cable between isolated building steel structural members to ensure a continuous potential ground plane for the entire building structural system.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall provide a complete support system for all low-voltage wiring within ceiling cavity areas.

B. Systems that may have some exposed wiring above ceiling areas are:

1. Fire alarm system
2. Public address systems
3. Telephone systems
4. Security systems
5. Energy management systems
6. Lighting controls

C. Exposed wiring is allowed only in above accessible ceiling areas.

D. Low-voltage wiring systems shall not share supports. Systems shall be independent of each other.

E. Wiring installed under Division 26 Specifications shall not share the cable tray or fire wall penetration pathways installed under Division 27 Specifications. All wiring under this division shall be independently supported.

PART 2 - PRODUCTS

2.01 SUPPORTS

A. The systems shall be supported by one of the following devices:

1. J-Hooks
2. D-Ring (flexible)
3. Cable Hooks
4. Other Pre-Approved Method

2.02 FIRE-RATED CABLE PATHWAY

A. Fire-rated cable pathway for cables run through fire walls shall bear the U.L. classification marking and tested in accordance with ASTM E814 (ANSI/UL 1479).

B. Pathways shall allow cables to pass through fire-rated walls and shall contain an Intumescent insert material that requires no adjustments to cable additions or subtractions.

C. All pathways shall be heavy-duty specification grade with an Intumescent insert material allowing for 0 to 100 percent visual fill of conductors.

D. The pathway shall have a fire rating equal to the rating of the barrier in which the device is installed.

E. Pathway shall be provided with steel wall plates allowing for single or multiple devices to be ganged together.

F. Approved manufacturer: "Specified Technologies, Inc." EZ-Path Fire Rated Pathway, Phone (800) 992-1180 or at www.stifirestop.com; or approved equivalent.

2.03 CONDUIT INSULATING BUSHINGS

A. EMT conduit stubs for exposed low voltage cabling shall be fitted with plastic insulating bushings equivalent to "Bridgeport" TWB Series.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Support all low-voltage exposed system wiring at 5'-0" centers. Provide wire ties at center point between supports. Refer to Specification Section 28 3000 FIRE DETECTION AND ALARM for specific requirements for fire alarm wiring installation.

B. All wiring shall be bundled and neatly tied.

C. Lighting control low voltage wiring concealed above ceilings shall be supported directly from building structure with wire ties at 5'-0" on center.

D. Install supports in positions that do not interfere with maintenance to air conditioning and/or electrical equipment items. Location should allow ability to add wiring in the future.

E. Low-voltage wiring shall not be supported from ceiling wire supports. It must be in addition to ceiling wire supports with orange color and connected to the structure above and ceiling below.

F. Provide fire-rated pathways through all fire-rated walls. Provide a minimum of six (6) 3" x 3" pathways above corridor ceiling at each corridor firewall. These shall be installed in a straight-mounted horizontal row. Provide a minimum of three (3) 3" x 3" pathways at each required firewall penetration (through wall). Systems shall not share a common pathway. Fire alarm and public address wiring shall be installed in separate pathways and all other systems shall be installed in the third pathway. If all pathways are not utilized, they should be installed as spares. Electrical Contractor shall coordinate all pathway requirements with all sub-system contractors including the control contractor. Electrical Contractor shall be responsible for the furnishing and installation of all required pathways including those locations indicated above.

G. All supports to be properly sized for the number of conductors supported.

H. No exposed wiring may rest on the ceiling structure.

I. All conduit stubs for exposed wiring shall have plastic insulating bushings installed. Refer to detail on the drawings.

J. All low-voltage wiring wall penetrations shall be sleeved. Sleeve shall be EMT conduit with bushings.

END OF SECTION

SECTION 26 0533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The work included under this section of these specifications consists of the furnishing of all material and equipment and in the performing of all labor and services necessary for a complete installation of the electrical conduit system and boxes as shown on the drawings and hereinafter specified.

PART 2 - PRODUCTS

2.01 CONDUIT

A. Rigid steel conduit and intermediate metal conduit (IMC) shall be hot dipped galvanized threaded type - color-coded threaded protectors - U.L. 1242 approved conformance with ANSI C80.6, latest revision.

B. Electrical metallic tubing (EMT) - clean enamel interior, U.L. 797 approved, conformance with ANSI C80.3, latest revision.

C. Flexible standard - steel type, U.L. approved, and approved for grounding.

D. Flexible moisture proof - oil proof PVC jacket extruded over steel flexible conduit with appropriate kellum strain grip at each termination. Type UA, U.L. approved type.

E. PVC Schedule 40 - U.L. approved.

2.02 FITTINGS

A. Elbows, couplings, and thread pipe - rigid hot dipped galvanized, threaded type. EMT - concrete tight. All U.L. approved. Setscrew couplings are acceptable for branch circuit conduit only.

B. Connectors – steel insulated throat compression type for EMT and rigid steel. All EMT connectors shall be raintight type where exposed to the weather. Setscrew or indenter type fittings are acceptable for branch circuit conduit only.

C. Flexible connectors - provide nylon throat insulated "Tite-Bite" or "Jake" connectors on all flexible steel conduit. Where fittings are brought into an enclosure with a knockout, provide a gasket assembly, consisting of an "O" ring and retainer on the outside.

D. Bushings - grounding type locknuts with plastic insulating bushing, for 1/2" and 3/4" conduit. 1" and larger conduits shall have insulated bonding and grounding bushings.

2.03 BOXES

A. Outlet boxes shall be standard hot dipped galvanized type of approved design and construction and of such form and dimension as best adapted to the specific location, kind of fixture or device to be used, and the number, size and arrangement of conduits connecting thereto.

B. Outlet boxes shall be provided with approved 3/8" fixture studs, where required.

C. Outlet boxes for exposed and damp locations shall be cast type of such forms and dimensions as best adapted to the specific location or purpose.

D. All technology boxes will be a single-gang, 2-1/2" deep box, except where multi-gang is indicated for A/V.

E. Exterior outlet boxes shall be approved marine type of cast iron with threaded bosses for conduit, and gasketed cover plate.

F. Cover plates shall be designed and constructed to fit and match exactly the outlet box on which they are installed.

G. Special outlet boxes may be required where conditions limit the use of standard boxes.

2.04 FLOOR BOXES

A. Floor boxes shall be flush or recessed type, cast iron or manufactured from stamped steel and then painted by manufacturer with a fusion-bonded epoxy before encapsulation in concrete, and be approved for use on ground and above-grade floors (-OG). Floor boxes shall be designed for 4" slab depth, fully adjustable before and after concrete pour. Boxes shall be complete with cover plates and hinged lockable device covers.

B. Floor boxes in areas requiring pedestals such as in kitchens, shall be 1-gang service fitting with 3/4" rigid threaded conduit stub and accessories for GFI device, equivalent to “Wiremold” 525 Series.

C. Approved manufacturer: "Steel City" 640 Series, “Wiremold” 880CS Series, or approved equivalent by “Hubbell” for boxes requiring power only, except kitchen.

D. “Wiremold” RFB9-OG Series, “Hubbell” HBLCFB5018ASE, or “Steel City” 667-SC, for boxes requiring both power and technology. Provide device plates, lid and accessories as required by plans and type of floor in which installed, and as approved by the Architect.

E. Refer to Architectural Specifications and Technology Drawings for floor boxes and other special boxes for the technology system. Electrical Contractor shall provide and install all boxes required by these specifications and drawings.

2.05 JUNCTION AND PULL BOXES

A. Junction and pull boxes shall be hot dipped code gauge sheet steel with screwed-on cover plates.

B. Boxes used in exterior, damp locations, and flush in slab floors shall be hot dipped galvanized cast iron type with threaded hubs as manufactured by "Appleton", "Russell & Stoll" or "Crouse-Hinds".

2.06 EXTERIOR IN-GRADE PULL BOXES

A. Exterior site in-grade pull boxes, handholes and manholes shall be precast polymer concrete construction, conforming to ANSI/SCTE 77 with Tier rating based on loading requirements and installation application. Box shall be sized per N.E.C. 314. Provide waterproof bolt-down cover with appropriate logo.

B. Boxes shall be equivalent to “Quazite” PG Series.

PART 3 - EXECUTION

3.01 INSTALLATION – CONDUIT

A. Conduit system shall be complete from point of origin to all outlets shown or specified. Locations of exposed runs will be subject to the Architect's approval. No diagonal runs will be permitted. Installation within 6” of bottom of roof deck is not allowed. All wiring in exposed spaces within building shall be installed in EMT or rigid steel conduit, except as identified below.

B. Conduits may be electric metallic tubing, except as specified below. EMT conduit is acceptable for all interior locations where not subject to physical damage, including concealed within walls, above ceilings, and exposed on walls and ceilings in electrical and mechanical rooms. EMT and IMC conduit shall not be mounted on floors. Box connections for EMT shall be of the compression type made up tight.

C. MC cable may be utilized only for wiring from branch circuit junction boxes to devices where concealed in walls and for light fixture whips where concealed above ceilings. MC cable shall be securely fastened and shall not droop near ceiling. MC cable shall contain green equipment ground conductor and be equivalent to “Southwire” Armorlite Series.

D. Conduit sizes not shown on the drawings shall be in accordance with NEC rules.

E. Minimum size of conduit shall be 3/4” for all individual branch circuits, ¾” for all homerun circuits, and 1” for telecommunications unless indicated otherwise on the drawings.

F. Horizontal runs of conduit shall be so installed, if possible, to provide a natural drain for condensation, without pockets, or traps where moisture can collect.

G. Homerun circuits may be combined in a common conduit wherever advantageous, provided all requirements of the NEC are met, a maximum of nine (9) current-carrying conductors (maximum of 4 hots and 4 neutrals) shall be allowed under this provision. Any deviation from this must be submitted to the Engineer for approval prior to installation. Grouping of homerun conduits into a wireway above panelboards is not allowed. All homerun conduits shall terminate at the panelboard.

H. Make motor and equipment connections with 18 inches flexible moisture proof conduit. Provide kellum grips at each end of conduit where subject to tension.

I. Make connections to recessed lighting fixtures with MC cable or 3/8" flexible standard conduit. Do not exceed 6'-0" length. Flexible conduit used for light fixture connections shall not be supported from wires that support the ceiling grid. They may be supported by the wires that support the light fixture.

J. Flexible conduit shall be used only for light fixture connections and for connections of motors and equipment. Do not exceed maximum lengths indicated.

K. Exterior conduits for fire alarm devices, lighting, telephone, etc., installed underground shall be Schedule 40 PVC with rigid steel elbows and rigid steel above grade, with backfill of red sand. Initial 6”-12” of backfill for underground primary and secondary electrical service conduits and all exterior circuit conduits shall be screened red arena sand. In addition, underground secondary electrical service conduits shall be encased in red concrete with a minimum of 3’-0” cover.

L. Provide burial tape 12” above all exterior electrical circuits.

M. All feeder conduits run under slab and underground service feeders shall be PVC Schedule 40 with rigid galvanized steel elbows. All PVC conduits below slab shall convert to rigid steel from elbow to panel connection. All branch circuit conduits run under slab shall be rigid steel only. PVC is not allowed for branch circuits run under slab. All conduits under slab shall be installed directly on top of 12” layer of pea gravel. All exposed exterior aboveground conduit shall be rigid steel. All feeders and branch circuits installed underground shall be buried with a minimum of 24” cover above conduit, unless designated on the drawings to be deeper.

N. Underground conduits must be sealed watertight where entering the building. Sealant shall be identified for use with conductor or cable in conduit.

O. Conduits shall not be installed exposed across the roof unless approved by the Engineer. All conduit on the roof shall be rigid steel. IMC may be utilized in lieu of rigid steel where location is not subject to foot traffic. When approved or shown on the drawings to be run across the roof, conduits shall be supported at 10’ intervals on corrosion-resistant pipe rollers with mounting curbs secured to the roof, similar to that shown for mechanical piping as detailed on the Architectural Drawings.

P. Conduit penetrations through the roof shall have pitch pan properly installed to prevent water leakage. All pitch pans shall be installed by the Roofing Contractor.

Q. Conduit running to rooftop equipment shall run through the roof curb of each unit in location designated by manufacturer. If this is not allowed by manufacturer, conduit shall run through the roof with pitch pan located a minimum of 18” from outside of unit. Connect to disconnect switch on unit with a short length (6’ maximum) of sealtight flexible conduit.

R. Stub four (4) 4” rigid steel conduits with bushings on each end from all wiring, data, and head-end rooms (IDF/MDF) to above corridor ceiling and/or to cable tray.

3.02 INSTALLATION – BOXES

A. Unless otherwise shown, specified, or directed, elevation of outlet boxes, etc., shall be in accordance with Architectural Drawings and Specifications. The following elevations apply unless otherwise noted.

Duplex Wall Receptacle (Appliances) 3'-6" (above floor)

B. Other special outlets shall be installed as shown or specified on the drawings.

C. Check Architectural, Structural, and Mechanical drawings and shop drawings to determine locations and type of walls, partitions, wainscoting, doors, windows, chalkboards, tackboards, cabinets, furniture, air diffusers, convectors, radiators, ductwork, and plumbing fixtures to determine other factors relating to correct location of outlets. Determine locations where connections are made to equipment or fixtures by consulting with supplier and shop drawings of equipment or fixture. Do not scale drawings for location of outlets.

D. Where outlets are installed in walls or partitions of concrete block, tile or in walls containing wainscoting, install either top of box near top of course, or bottom of box near bottom of course, whichever is nearer to specified approximate height. Top or bottom of cover plate of installed outlet shall not extend more than one-eighth inch into joint. In locations where top of wainscot ends at or near specified approximate heights of outlets, install outlets so that cover plate is either all in wainscot or all above wainscot, whichever is nearer specified approximate height of outlet.

E. Install outlets parallel and perpendicular to adjacent walls and ceilings and flush with surrounding surfaces. Where outlets are indicated above each other, install on same vertical centerline. Where other trades install outlets, coordinate work to be on same centerline.

F. The Architect reserves the right to determine exact locations of all outlets, to confirm locations determined by the Contractor, or to make minor changes in outlet locations prior to roughing-in.

G. Any outlet installed in an inaccessible location that could have been avoided by reference to above mentioned drawings and compliance with above procedures shall be relocated.

H. Four-inch boxes shall not be used where more than one switch or receptacle is installed, but solid gang (up to 4-gang maximum) with suitable covers shall be used.

I. All outlet boxes that require covers shall be provided with same, and they shall be of such construction and design as to fit and match exactly the outlet box on which they are installed. Switch boxes, etc., shall have covers aligned with the walls, floors, and trim. Pull boxes, etc., junction boxes, and all other outlet boxes to which no fixture or device is to be attached shall be fitted with blank covers.

J. All junction boxes in spaces concealed from view shall be labeled with circuit number clearly visible on cover and shall not be painted over. In spaces exposed to view, where boxes are to be painted over, label cover inside. Labels shall be machine-printed type with adhesive back, with minimum 3/4" high letters.

3.04 INSTALLATION – PULL AND JUNCTION BOXES

A. Junction and pull box size shall be as shown on the drawings, specified and/or required, and shall be set flush with wall or ceiling in concealed work. If size is not shown on the drawings, provide box size which meets or exceeds NEC 314 minimum requirements.

B. Junction and pull boxes shall be installed as required by the National Electrical Code.

C. Identify pull boxes with stencil letters indicating the function of the box. EX: FEEDER FOR PANEL ___.

3.05 ROUGH-IN FOR THEATRICAL, TELECOMMUNICATIONS, PUBLIC ADDRESS, ETC.

A. Provide all conduit rough-in for telecommunication systems indicated on "T" Series Drawings, including all boxes, interconnect conduits and required sleeves.

B. Install nylon pull string in all conduits and label all conduits indicating terminal point.

C. Provide all conduit rough-in for A/V systems in Cafetorium, Gymnasium and Library, including all required boxes.

D. Provide all conduit rough-in for local A/V systems in teaching locations shown on the drawings.

E. Contractor shall review the entire contract bid package including Architectural, Civil, specifications and drawings and provide conduit and box installation as required by these documents.

3.06 COLOR CODING

A. At locations concealed above ceilings, provide color bands approximately two inches wide applied at 10' centers and at pull box locations. Color-coding shall be as follows:

Fire Alarm – Red
Voice/Data – Blue
Security – Green
Media Management – Yellow
CATV/MATV – Black

END OF SECTION

SECTION 26 0800

COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. This section comprises the requirements for electrical commissioning.

PART 2 - PRODUCTS

2.01 INSTRUMENTS

A. Provide model and serial numbers of all instruments used in testing the electrical equipment.

PART 3 - EXECUTION

3.01 TESTING (GENERAL)

A. The Contractor shall make all reasonable tests as required by the Architect to prove the integrity of his work, and shall leave the complete electrical installation in first class condition and ready for operation.

B. Where single phase, 3- or 4-wire combinations are used for branch circuit distribution, the "hot" conductors must be of different phases.

C. As soon as all electrical work is complete and prior to the final project review, the various systems and equipment shall be subjected to the following tests:

1. Feeder conductor insulation shall be checked by megger to ensure that resistance is not less than that specified.

2. All systems shall be tested to insure freedom from short circuits or other faults.

3. All motors shall be tested for proper starting and direction of rotation.

4. All lighting circuits shall be operated.

5. All receptacles shall be tested with a "Woodhead" #1750 or equivalent tester and faulty conditions shall be corrected.

6. All other electrically operated equipment shall be operated for verification of proper performance.

7. Verify grounding electrode system at service entrance is installed as specified in Section 26 0526 and as detailed on the drawings. Verify each dry-type transformer installation is grounded per Section 26 2000 and as detailed on the drawings.

D. This Contractor shall furnish to the Architect two (2) dated copies of all test readings, including the nameplate record of test instruments and the name and title of the person or persons who performed the tests, prior to final project review. Contractor shall certify that all duplex receptacles have been tested and are in correct operating condition.

3.02 TESTING (SPECIFIC)

A. Perform complete testing of the following systems:

1. Inverters
2. Fire alarm system
3. Power factor correction equipment
4. Lighting control systems
5. Surge protection devices
6. Grounding systems
7. Emergency lighting system
8. Other systems as required

B. Tests shall be performed as required to determine that the systems are performing in a first class condition.

C. All testing shall be done in the presence of a manufacturer's representative, who by letter to the Architect shall attest to the system working properly and that he has instructed the Owner concerning how to test the system and the recommended frequency of such testing along with recommendations on keeping logs of such tests.

D. Make all corrections, additions, adjustments, etc. to place all systems in first class working order.

END OF SECTION

SECTION 26 0900

INSTRUMENTATION AND CONTROL FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. All wiring and conduit for the automatic HVAC control system shall be furnished and installed by the Mechanical Contractor, except as follows:

1. Conduit and junction box rough-in for room sensors
2. Power wiring for smoke dampers and doors.
3. Wiring for all interlock wiring for exhaust fans with A/C units.
4. All local exhaust fan switches.
5. All 120 volt wiring, regardless of function.

B. The Electrical Contractor shall furnish and install all control wiring specifically indicated on the electrical drawings and all control wiring and/or conduit required for all systems except the automatic HVAC control system, except as indicated herein.

C. Refer to detail on the drawings for conduit and junction box rough-in for HVAC control system room sensors.

PART 2 - PRODUCTS

2.01 CONTROL DEVICES

A. Motor controls and pilot devices, such as starters, switches, pushbutton stations, etc., will be furnished with the equipment unless otherwise noted and/or specified in other sections of this specification.

B. Relays, photocell and time clocks for control of lighting and power circuits shall be furnished and installed by the Electrical Contractor, complete with all control wiring, conduit, boxes, etc., required for proper operation.

C. Provide 24V control power transformers as required for smoke dampers, smoke doors, etc. Transformer VA rating shall be adequate for devices powered. Transformers shall be mounted in NEMA-1 enclosure on wall, not within air conditioning equipment. Transformers shall be provided power from dedicated 120 volt circuit.

2.02 CONTROL RELAYS – WATER SYSTEM

A. Install a 2 pole relay with one (1) N.O. and one (1) N.C. contact for all domestic hot water circulation pumps. Run conduit and control wiring from relays to nearest HVAC automatic control system control point. Utilize contact that corresponds with energy management system operation.

2.03 RELAYS & CONTACTORS

A. Relays and contactors shall be mechanically held type, N.O. 30 amp 100% tungsten filament load rating at 600 volt AC per pole, NEMA 1 enclosures. Where indicated, relays shall have an "on-off" pushbutton installed in the cover. Regular control type or motor relays are not acceptable for any type lighting control.

B. Contactors shall be sized as indicated on the drawings. If not indicated on the drawings, contactors shall be sized larger than circuit being controlled.

C. Voltage rating shall exceed the circuit voltage controlled.

D. Momentary contact switches, keyed type where indicated shall be provided for relay and contactor control.

E. Approved Manufacturer: "Square-D", “Eaton”, “ASCO”, or approved equivalent.

2.04 PHOTOCELL

A. Heavy-duty die-cast housing, weatherproof, cadmium cell, adjustable light level detector, ½” conduit mounting arm. Size and rating shall be at least 150% of load.

B. Approved manufacturer is "Paragon" Model CW200 rated for 120/277 volts, or approved equivalent by “Intermatic”, “Tork”, or specified manufacturer of lighting relay panels.

2.05 EMERGENCY PUSHBUTTON STATIONS

A. Where indicated on the drawings, provide emergency pushbutton station equivalent to “STI” Series 2000 Stopper Station with clear protective cover.

B. Refer to the drawings for requirements such as color, button/switch activation type and message labeling.

PART 3 - EXECUTION

3.01 INSTALLATION - CONTROL WIRING

A. Install all motor controllers furnished by other trades, and make final electrical connections to all equipment.

B. Control conductors shall be a minimum of #14 THHN stranded.

C. Control conductors for the automatic control system will be furnished and installed by the Mechanical Contractor, except for wiring for excepted items listed in Paragraph 1.01 A. above.

D. All control wiring not part of the HVAC automatic control system shall be furnished and connected by the Electrical Contractor.

E. Control wiring is not necessarily indicated on the drawings.

F. Any control device not part of the HVAC automatic control system that requires control wiring shall have the proper control wiring installed and connected for proper operation, whether indicated or not.

G. Provide a dedicated 120-volt circuit to all control panels and devices as required for proper system operation. These items are not necessarily indicated on the drawings. Allow for two (2) 1 pole, 20 amp circuits based on two (2) #12 & ground in 3/4” conduit and 100 ft. run.

3.02 INSTALLATION - CONTROL DEVICES

A. Furnish and install all electrical control devices in their respective systems and place in proper working order.

B. Relays serving exterior lighting shall be controlled by series connection of one (1) photocell and time schedule with input for "on/off" control unless noted otherwise on the drawings. Relays shall be rated 277 volt AC, 20 amps per pole. Relays shall be mounted in NEMA 1 cabinet as shown on the drawings.

C. Install a photocell bypass switch at all relays and/or contactors serving exterior lighting.

3.03 EQUIPMENT CONNECTION

A. Before roughing for any item of equipment, consult with equipment installer to insure proper positioning of conduits and final connection of equipment. Cost to reposition conduits because of failure to comply with above instructions must be borne by the Contractor.

B. Electrical equipment that has not been assigned to a designated circuit shall be connected as required and circuited to an appropriately sized circuit breaker in the nearest panelboard with compatible voltage.

C. Connect all electrical equipment whether indicated on the drawings or not. If electrical equipment is indicated on the mechanical or architectural drawings, it shall be correctly connected at no additional cost to the Owner. If electrical equipment is not shown on the mechanical or architectural drawings or specified in the mechanical or architectural specifications, it shall not be the Contractor’s responsibility to connect. The intent is to require the Electrical Contractor to thoroughly review the total bid package to determine the extent of electrical requirements. Verify exact connection point and circuit requirements for equipment not shown prior to connecting.

D. Refer to equipment specifications in Divisions 3 through 14 for rough-in requirements.

E. Contractor shall allow for three (3) 1 pole 20 amp circuits for miscellaneous equipment connections based on two (2) #10 & ground in 3/4” conduit and 100 ft. run.

END OF SECTION

SECTION 26 0943

DIGITAL LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Digital Lighting Controls
2. Relay Panels

1.02 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) (www.ansi.org and www.ieee.org)
B. International Electrotechnical Commission (IEC) (www.iec.ch)
C. International Organization for Standardization (ISO) (www.iso.ch):
D. National Electrical Manufacturers Association (NEMA) (www.nema.org)
E. WD1 (R2005) - General Color Requirements for Wiring Devices.
F. Underwriters Laboratories, Inc. (UL) (www.ul.com)

1.03 SYSTEM DESCRIPTION & OPERATION

A. The Lighting Control and Automation system as defined under this section covers the following equipment:

1. Digital Lighting Management (DLM) local network – Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.

2. Digital Room Controllers – Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities.

3. Digital Fixture Controllers – Self-configuring, digitally addressable one relay fixture-integrated controllers for on/off/0-10V dimming control.

4. Digital Occupancy Sensors – Self-configuring, digitally addressable, calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.

5. Digital Switches – Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications.

6. Handheld remotes for personal control – On/Off, dimming and scene remotes for control using infrared (IR) communications. Remote may be configured in the field to control selected loads or scenes without special tools.

7. Digital Daylighting Sensors – Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications for daylight harvesting using switching, bi-level, tri-level or dimming control.

8. Configuration Tools – Handheld remote for room configuration and relay panel programming provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away.

1.04 SUBMITTALS

A. Submittals Package: Submit the shop drawings, and the product data specified below at the same time as a package.

B. Shop Drawings:

1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.

2. Show exact location of all digital devices, including at minimum sensors, load controllers, and switches for each area on reflected ceiling plans. (Contractor must provide AutoCAD format reflected ceiling plans.)

3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.

4. Network riser diagram including floor and building level details. Include network cable specification and end-of-line termination details, if required. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.

C. Product Data: Catalog sheets, specifications and installation instructions.

D. Include data for each device which:

1. Indicates where sensor is proposed to be installed.
2. Prove that the sensor is suitable for the proposed application.

1.05 QUALITY ASSURANCE

A. Manufacturer: Minimum 10 years of experience in manufacture of lighting controls.

1.06 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1. Ambient temperature: 0° to 40° C (32° to 104° F).
2. Relative humidity: Maximum 90 percent, non-condensing.

1.07 WARRANTY

A. Provide a five year limited manufacturer's warranty on all room control devices and panels.

1.08 MAINTENANCE

A. Spare Parts:

1. Provide spares of each product to be used for maintenance as listed below:
2. Two (2) of each type of sensor used and four (4) power packs.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: WattStopper

1. System: Digital Lighting Management (DLM)

B. Basis of design product: WattStopper Digital Lighting Management (DLM) or subject to compliance and prior approval with specified requirements of this section, one of the following:

1. NLight
2. Cooper
3. ILC

2.02 DIGITAL LIGHTING CONTROLS

A. Furnish the Company's system which accommodates the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories which suit the lighting and electrical system parameters.

2.03 DLM LOCAL NETWORK (Room Network)

A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building.

B. Features of the DLM local network include:

1. Plug n' Go™ automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.

2. Simple replacement of any device in the local DLM network with a standard off the shelf unit without requiring significant commissioning, configuration or setup.

3. Push n' Learn™ configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.

4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

C. Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable.

D. If manufacturer's pre-terminated Cat5e cables are not used for the installation, the contractor is responsible for testing each cable following installation and supplying manufacturer with test results.

E. WattStopper Product Number: LMRJ-Series

2.04 DIGITAL LOAD CONTROLLERS (ROOM, PLUG LOAD AND FIXTURE CONTROLLERS)

A. Digital controllers for lighting and plug loads automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room and plug load controllers shall be provided to match the room lighting and plug load control requirements. The controllers will be simple to install, and will not have dip switches or potentiometers, or require special configuration for standard Plug n' Go applications. The control units will include the following features:

1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.

2. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf.

3. Multiple room controllers connected together in a local network must automatically arbitrate with each other, without requiring any configuration or setup, so that individual load numbers are sequentially assigned using each controller's device ID's from highest to lowest.

4. Device Status LEDs to indicate:

    a. Data transmission
    b. Device has power
    c. Status for each load
    d. Configuration status

5. Quick installation features including:

    a. Standard junction box mounting
    b. Quick low voltage connections using standard RJ-45 patch cable

6. Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power:

a. Turn on to 100%
b. Turn off
c. Turn on to last level

7. Each load shall at a minimum be configurable to operate in the following sequences based on occupancy:

   a. Auto-on/Auto-off (Follow on and off)
   b. Manual-on/Auto-off (Follow off only)

8. The polarity of each load output shall be reversible, via digital configuration, so that on is off and off is on.

9. BACnet object information shall be available for the following objects:

   a. Load status
   b. Electrical current (when available)
   c. Total watts per controller
   d. Schedule state – normal or after-hours
   e. Demand response enable and disable
   f. Room occupancy status
   g. Total room lighting and plug loads watts
   h. Total room watts/sq ft
   i. Force on/off all loads

10. UL 2043 plenum rated

11. Manual override and LED indication for each load

12. Dual voltage (120/277 VAC, 60 Hz), or 347 VAC, 60 Hz (selected models only). 120/277 volt models rated for 20A total load, derating to 16A required for some dimmed loads (forward phase dimming); 347 volt models rated for 15A total load; plug load controllers carry application-specific UL 20 rating for receptacle control.

13. Zero cross circuitry for each load

14. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

B. On/Off Room Controllers shall include:

1. One or two relay configuration
2. Efficient 150 mA switching power supply
3. Three RJ-45 DLM local network ports with integral strain relief and dust cover
4. WattStopper product numbers: LMRC-101, LMRC-102

C. On/Off/Dimming enhanced Room Controllers shall include:

1. Real time current monitoring
2. Multiple relay configurations

   a. One, two or three relays (LMRC-21x series)
   b. One or two relays (LMRC-22x series)

3. Efficient 250 mA switching power supply
4. Four RJ-45 DLM local network ports with integral strain relief and dust cover

5. One dimming output per relay

   a. 0-10V Dimming - Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting. (LMRC-21x series)

   b. Line Voltage, Forward Phase Dimming - Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward phase compatible ELV, neon/cold cathode and incandescent loads. (LMRC-22x series)

   c. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver.

   d. The LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim.

   e. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100% dimming range defined by the minimum and maximum calibration trim.

   f. Calibration and trim levels must be set per output channel.

   g. Devices that set calibration or trim levels per controller are not acceptable.

   h. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.

6. Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events.

7. Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value.

8. The following dimming attributes may be changed or selected using a wireless configuration tool:

a. Establish preset level for each load from 0-100%
b. Set high and low trim for each load
c. Set lamp burn in time for each load up to 100 hours

9. Override button for each load provides the following functions:

a. Press and release for on/off control
b. Press and hold for dimming control

10. WattStopper product numbers: LMRC-111, LMRC-112, LMRC-211, LMRC-212, LMRC-213, LMRC-221, LMRC-222

D. Fixture Controllers shall include:

1. A form factor and product ratings to allow various OEM fixture manufacturers to mount the device inside the ballast/driver cavity of standard-sized fluorescent or LED general lighting fixtures.

2. One 3A 120/277V rated mechanically held relay.

3. Programmable behavior on power up following the loss of normal power:

a. Turn on to 100%
b. Turn off
c. Turn on to last level

4. Requirement for 7 mA of 24VDC operating power from the DLM local network.

a. The Fixture Controller does not require a connection to a neutral conductor to operate, and unlike other types of Load Controllers it does not contribute power to the DLM local network to drive accessory devices.

b. Power to drive the LMFC Fixture Controller electronics can come from any Room or Plug Load Controller, LMPB-100 Power Booster and/or LMZC-301 Zone Controller (described later in the LMCP LIGHTING CONTROL PANELS specification section).

5. 0-10V dimming capability via a single 0-10 volt analog output from the device for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Fixture Controller.

6. Terminals to connect an RJ-45 adaptor with 24” leads, mountable in a ½” KO, for connection to the DLM local network.

a. The adaptor leads are insulated for use in a fixture cavity, and the lead length allows the OEM fixture manufacturer flexibility to position the Fixture Controller and the RJ45 jack in the best locations on each fixture.

7. A complete set of dimming features described above in the section detailing On/Off/Dimming Enhanced Room Controllers (subsection C.5 onward).

8. WattStopper product numbers: Fixture Controller: LMFC-011, DLM Cable Connector: LMFC-RJ-50-24, Power Booster: LMPB-100

2.05 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR

A. Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor.

B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:

1. Digital calibration and pushbutton configuration for the following variables:

   a. Sensitivity – 0-100% in 10% increments
   b. Time delay – 1-30 minutes in 1 minute increments
   c. Test mode – Five second time delay
   d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
   e. Walk-through mode

2. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

3. Programmable control functionality including:

   a. Each sensor may be programmed to control specific loads within a local network.
   b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
   c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off.
   d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
   e. Ultrasonic and Passive Infrared
   f. Ultrasonic or Passive Infrared
   g. Ultrasonic only
   h. Passive Infrared only
   i. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.

4. One or two RJ-45 port(s) for connection to DLM local network.

5. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

6. Device Status LEDs, which may be disabled for selected applications, including:

a. PIR detection
b. Ultrasonic detection
c. Configuration mode
d. Load binding

7. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.

8. Manual override of controlled loads.

9. All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.

C. BACnet object information shall be available for the following objects:

1. Detection state
2. Occupancy sensor time delay
3. Occupancy sensor sensitivity, PIR and Ultrasonic

D. Units shall not have any dip switches or potentiometers for field settings.

E. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

F. WattStopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

2.06 DIGITAL WALL SWITCH OCCUPANCY SENSORS

A. Wallbox mounted passive infrared PIR or dual technology (passive infrared and ultrasonic) digital occupancy sensor with 1 or 2 switch buttons.

B. Digital Occupancy Sensors shall provide scrolling LCD display for digital calibration and electronic documentation. Features include the following:

1. Digital calibration and pushbutton configuration for the following variables:

a. Sensitivity – 0-100% in 10% increments
b. Time delay – 1-30 minutes in 1 minute increments
c. Test mode – Five second time delay
d. Detection technology – PIR, Dual Technology activation and/or re-activation.
e. Walk-through mode
f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

2. Programmable control functionality including:

a. Each sensor may be programmed to control specific loads within a local network.

b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically during the configurable period of time (default 10 seconds) after turning off.
d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
    1) Ultrasonic and Passive Infrared
    2) Ultrasonic or Passive Infrared
    3) Ultrasonic only
    4) Passive Infrared only

3. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.

4. Two RJ-45 ports for connection to DLM local network.

5. Two-way infrared (IR) transceiver to allow remote programming through handheld configuration tool and control by remote personal controls.

6. Device Status LEDs including:

    a. PIR detection
    b. Ultrasonic detection
    c. Configuration mode
    d. Load binding

7. Assignment of any occupancy sensor to a specific load within the room without wiring or special tools.

8. Assignment of local buttons to specific loads within the room without wiring or special tools

9. Manual override of controlled loads

10. All digital parameter data programmed into an individual wall switch sensor shall be retained in non-volatile FLASH memory within the wall switch sensor itself. Memory shall have an expected life of no less than 10 years.

C. BACnet object information shall be available for the following objects:

1. Detection state
2. Occupancy sensor time delay
3. Occupancy sensor sensitivity, PIR and Ultrasonic
4. Button state
5. Switch lock control
6. Switch lock status

D. Units shall not have any dip switches or potentiometers for field settings.

E. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

F. Two-button wall switch occupancy sensors, when connected to a single relay dimming room or fixture controller, shall operate in the following sequence as a factory default:

1. Left button

    a. Press and release - Turn load on
    b. Press and hold - Raise dimming load

2. Right button

    a. Press and release - Turn load off
    b. Press and hold - Lower dimming load

G. Low voltage momentary pushbuttons shall include the following features:

1. Load/Scene Status LED on each switch button with the following characteristics:

    a. Bi-level LED
    b. Dim locator level indicates power to switch
    c. Bright status level indicates that load or scene is active

2. The following button attributes may be changed or selected using a wireless configuration tool:

    a. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).

    b. Individual button function may be configured to Toggle, On only or Off only.

    c. Individual scenes may be locked to prevent unauthorized change.

    d. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.

    e. Ramp rate may be adjusted for each dimmer switch.

    f. Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependent; each button may be bound to multiple loads.

    g. WattStopper part numbers: LMPW, LMDW. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening.

2.07 DIGITAL WALL SWITCHES

A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration. Wall switches shall include the following features:

1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.

3. Configuration LED on each switch that blinks to indicate data transmission.

4. Load/Scene Status LED on each switch button with the following characteristics:

   a. Bi-level LED
   b. Dim locator level indicates power to switch
   c. Bright status level indicates that load or scene is active
   d. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.

5. Programmable control functionality including:

   a. Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority

   b. Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.

6. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.

B. BACnet object information shall be available for the following objects:

1. Button state
2. Switch lock control
3. Switch lock status

C. Two RJ-45 ports for connection to DLM local network.

D. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required to achieve multi-way switching.

E. The following switch attributes may be changed or selected using a wireless configuration tool.

F. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).

1. Individual button function may be configured to Toggle, On only or Off only.
2. Individual scenes may be locked to prevent unauthorized change.
3. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
4. Ramp rate may be adjusted for each dimmer switch.
5. Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependant; each button may be bound to multiple loads.
6. WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening.

2.08 DLM HANDHELD USER INTERFACE REMOTES

A. Battery-operated handheld devices in 1, 2 and 5 button configurations for remote switching or dimming control. Remote controls shall include the following features:

1. Two-way infrared (IR) transceiver for line of sight communication with DLM local network within up to 30 feet.
2. LED on each button confirms button press.
3. Load buttons may be bound to any load on a load controller or relay panel and are not load type dependant; each button may be bound to multiple loads.
4. Inactivity timeout to save battery life.

B. A wall mount holster and mounting hardware shall be included with each remote control

C. WattStopper part numbers: LMRH-101, LMRH-102, LMRH-105.

2.09 DIGITAL DAYLIGHTING SENSORS

A. Digital daylighting sensors shall work with load controllers and relay panels to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to the controller or panel. Daylighting sensors shall be interchangeable without the need for rewiring.

1. Closed loop sensors measure the ambient light in the space and control a single lighting zone.

2. Open loop sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones.

3. Dual loop sensors measure both ambient and incoming daylight in the space to insure that proper light levels are maintained as changes to reflective materials are made in a single zone.

B. Digital daylighting sensors shall include the following features:

1. The sensor's internal photodiode shall only measure lightwaves within the visible spectrum. The photodiode's spectral response curve shall closely match the entire photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.

2. Sensor light level range shall be from 1-6,553 footcandles (fc).

3. The capability of ON/OFF, bi-level or tri-level switching, or dimming, for each controlled zone, depending on the selection of load controller(s) and load binding to controller(s).

4. For switching daylight harvesting, the photosensor shall provide a field-selectable deadband, or a separation, between the "ON Setpoint" and the "OFF Setpoint" that will prevent the lights from cycling excessively after they turn off.

5. For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a field-selectable minimum level.

6. Photosensors shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.

7. Photosensors shall provide adjustable cut-off time. Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off.

8. Optional wall switch override shall allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise lighting levels for a selectable period of time or cycle of occupancy.

9. Integral infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.

10. Configuration LED status light on device that blinks to indicate data transmission.

11. Status LED indicates test mode, override mode and load binding.

12. Recessed switch on device to turn controlled load(s) ON and OFF.

13. BACnet object information shall be available for the following daylighting sensor objects, based on the specific photocell's settings:
    a. Light level
    b. Day and night setpoints
    c. Off time delay
    d. On and off setpoints
    e. Up to three zone setpoints
    f. Operating mode – on/off, bi-level, tri-level or dimming

14. One RJ-45 port for connection to DLM local network.

15. A choice of accessories to accommodate multiple mounting methods and building materials. The photosensors may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Standard tube photosensors accommodate mounting materials from 0-0.62” thickness (LMLS-400, LMLS-500). Extended tube photosensors accommodate mounting materials from 0.62”-1.25” thickness (LMLS-400-L, LMLS-500-L). Mounting brackets are compatible with J boxes (LMLS-MB1) and wall mounting (LMLS-MB2). LMLS-600 photosensor to be mounted on included bracket below skylight well.

16. Any load or group of loads in the room can be assigned to a daylighting zone

17. Each load within a daylighting zone can be individually enabled or disabled for discrete control (load independence).

18. All digital parameter data programmed into a photosensor shall be retained in non-volatile FLASH memory within the photosensor itself. Memory shall have an expected life of no less than 10 years.

C. Closed loop digital photosensors shall include the following additional features:

1. An internal photodiode that measures light in a 100-degree angle, cutting off the unwanted light from bright sources outside of this cone.

2. Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software.

3. Automatically establishes application-specific setpoints following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of loads.

4. WattStopper Product Number: LMLS-400, LMLS-400-L.

D. Open loop digital photosensors shall include the following additional features:

1. An internal photodiode that measures light in a 60-degree angle (cutting off the unwanted light from the interior of the room).

2. Automatically establishes application-specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone.

3. Each of the three discrete daylight zones can include any non overlapping group of loads in the room.

4. WattStopper Product Number: LMLS-500, LMLS-500-L.

E. Dual loop digital photosensors shall include the following additional features:

1. Close loop portion of dual loop device must have an internal photodiode that measures light in a 100 degree angle, cutting off the unwanted light from sources outside of this cone.

2. Open loop portion of dual loop device must have an internal photodiode that can measure light in a 60 degree angle, cutting off the unwanted light from the interior of the room.

3. Automatically establishes application-specific set-points following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of load.

4. Device must reference closed loop photosensor information as a base line reference. The device must be able to analyze the open loop photosensor information to determine if an adjustment in light levels is required.

5. Device must be able to automatically commission setpoints each night to provide adjustments to electrical lighting based on changes in overall lighting in the space due to changes in reflectance within the space or changes to daylight contribution based on seasonal changes.

6. Device must include extendable mounting arm to properly position sensor within a skylight well.

7. WattStopper product number LMLS-600

2.10 HANDHELD AND COMPUTER CONFIGURATION TOOLS

A. A wireless configuration tool facilitates optional customization of DLM local networks using two-way infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool shall include but not be limited to:

1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.

2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.

3. Must be able to read and modify parameters for load controllers and relay panels, occupancy sensors, wall switches, daylighting sensors, network bridges, and identify DLM devices by type and serial number.

4. Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors.

5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.

6. Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls.

7. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.

8. Verify status of building level network devices.

C. WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

PART 3 - EXECUTION

1.01 CONTRACTOR INSTALLATION AND SERVICES

A. Contractor to install all devices and wiring in a professional manner. All line voltage connections to be tagged to indicate circuit and switched legs.

B. Contractor to install all room/area devices using manufacturer's factory-tested Cat 5e cable with pre-terminated RJ-45 connectors. If pre-terminated cable is not used for room/area wiring, the contractor is responsible for testing each field-terminated cable following installation, and shall supply the lighting controls manufactuerer with test results. Low voltage wiring topology must comply with manufacturer's specifications. Contractor shall route network wiring as shown in submittal drawings as closely as possible, and shall document final wiring location, routing and topology on as built drawings.

C. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated. Before start up, contractor shall test all devices to ensure proper communication.

D. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.

1. Adjust time delay so that controlled area remains lighted while occupied.

E. Provide written or computer-generated documentation on the configuration of the system including room by room description including:

1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
3. Load Parameters (e.g. blink warning, etc.)

F. Post start-up tuning – After 30 days from occupancy contractor shall adjust sensor time delays and sensitivities to meet the Owner's requirements as/if required. Provide a detailed report to the Architect / Owner of post start-up activities.

3.02 FACTORY SERVICES

A. Upon completion of the installation, the manufacturer's factory authorized representative shall start up and verify a complete fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with three weeks written notice of the system start up and adjustment date.

C. Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

D. Testing of the lighting control systems shall ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer’s instructions. Functional testing shall be performed in accordance with Section C408.3 of the 2018 International Energy Conservation Code (IECC).

E. Provide documentation certifying that the installed lighting controls meet documented performance criteria of Section C405 of the 2018 International Energy Conservation Code (IECC).

END OF SECTION

SECTION 26 2000

LOW VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Furnish and install 480 volt, three phase primary to 120/208 volt, three phase, four wire secondary dry-type transformers where indicated on the drawings.

1.03 REFERENCES

A. The transformers and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of ANSI, NEMA and UL.

B. Transformers shall meet the requirements of Federal Law 10 CFR Part 431 “Energy Efficiency Program for Certain Commercial and Industrial Equipment”.

PART 2 - PRODUCTS

2.01 DRY TYPE TRANSFORMERS

A. Dry-type transformers shall be general purpose individually mounted, two-windings, self-cooled, indoor type as noted on the plans, with 480 volt, 3 phase, 3-wire primary and 120/208 volt, 3 phase, 4-wire secondary.

B. Each transformer shall have not less than two (2) 2-1/2% taps above and four (4) 2-1/2% taps below normal voltage rating. Transformers shall be ventilated, have Class 220 insulation with copper windings, and NEMA 2 enclosure.

C. Transformers shall be designed for a 150^{o} heat rise at fully load determined by resistance over a 40^{o}C ambient when tested in accordance with NEMA standards.

D. Dry-type transformers shall not exceed standard decibel ratings as published by NEMA and ANSI.

E. Transformers shall meet or exceed the minimum efficiencies per Federal Law 10 CFR Part 431 “Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule”, as follows:

Three Phase kVA	Efficiency
15	97.9%
30	98.2%
45	98.4%
75	98.6%
112.5	98.7%
150	98.8%
225	98.9%
300	99.0%
500	99.1%

F. Dry-type transformers shall be provided with circuit breaker protection on the primary and secondary as scheduled on the plans and/or as required by the National Electrical Code. Circuit breakers shall be mounted adjacent to the side of the transformer housing in an NEMA 1 enclosure or as shown on the drawings.

G. Transformers of the size and type covered in U.L. Specification 506 shall be so listed and labeled.

H. Approved manufacturers: “Square D”, “Eaton”, “Siemens” or “ABB(GE)”.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Furnish and install transformers at locations indicated on the drawings.

B. Furnish and install a disconnect switch within sight and not more than 50’-0” away, to disconnect all ungrounded primary conductors. Disconnect switch shall not be required where feeder circuit breaker meets requirements for disconnect switch.

C. Connections to indoor transformers shall be made with short length of flexible conduit.

D. Each transformer shall be identified as to plan number, kVA, and primary and secondary voltage with 1-1/2" tall letters stenciled on the enclosure. A metal nameplate shall be affixed to the case of each transformer, listing all pertinent information.

E. Transformers shall be wall-mounted, floor-mounted or suspended as noted on the drawings. Floor-mounted transformers shall have a 4" concrete base. Transformer legs or base shall rest on four (4) flush type neoprene mountings equivalent to “Korfund” RD Series for floor or wall-mounted types. Suspended transformers shall be provided with four (4) vibration hangers consisting of steel housing and neoprene isolation element equivalent to “Korfund” RHD Series. For all isolator types, model number shall be based on size (weight) of transformer.

F. Provide a neutral ground at each dry type transformer that is separate from all other grounds. Neutral ground shall not exceed 25 ohms and be grounded as close as possible to the transformer. Ground per National Electrical Code. Refer to detail on the drawings for additional requirements.

G. Check all transformer neutral grounds at finish of project with all circuits “on” for voltage on the neutral ground. Voltage indication should be zero (0) volts. If there is a voltage on the neutral ground, re-ground the transformer.

END OF SECTION

SECTION 26 2100

LOW VOLTAGE POWER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. New building will be served by service feeders from new service equipment provider pad-mounted transformer to main switchboard in the building. Required voltage and phase is indicated on the drawings.

B. Installation of conduits from secondary of pad-mounted transformer to main switchboard and secondary conductors is a part of this contract. Concrete pad and primary ducts to be provided by the Contractor in strict accordance with service equipment provider requirements.

C. Installation of primary ducts from service equipment provider transformers to service point shall be part of this contract. Refer to drawings for locations. Verify exact service point with the service equipment provider.

D. Service Equipment Provider for this project is "Oncor Electric Delivery". Michael Swiney at (214) 330-2934.

E. Installation costs from Service Equipment Provider shall be paid from service allowance.

PART 2 - PRODUCTS

2.01 MATERIAL

A. All required material is covered by other sections of these specifications.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Verify all service equipment provider requirements for ducts, transformer pad, etc. and comply with all requirements.

B. Encase all secondary duct with red concrete at a minimum 3” on all sides. Install duct at 36” below grade to top of concrete.

C. Install all secondary cables from main switchboard to the pad-mounted transformer.

D. Provide a 5' lateral separation from electrical primary conduits to other utility conduits. Minimum vertical crossing clearance of electrical conduits from utility conduits is twelve inches (12"). All primary conduits shall be gray Schedule 40 PVC with gray Schedule 80 PVC elbows and rigid steel above grade. Contractor shall obtain a complete set of Service Equipment Provider criteria for installation of pads, duct banks, etc., and strictly comply with this criterion.

E. Primary pull boxes, if required, shall be approved by Service Equipment Provider and be purchased from a supplier approved by Service Equipment Provider.

END OF SECTION

SECTION 26 2413

MAIN SWITCHBOARD

PART 1 - GENERAL

1.01 SUMMARY

A. New building will be served by secondary service feeder from new power company pad-mounted transformer as indicated on the drawings.

B. Metering will be accomplished at the pad-mounted transformer.

C. Main Switchboard - Furnish and install the Service Entrance switchboards as herein specified and shown on the associated electrical drawings. Switchboard shall be marked as suitable for service entrance.

1.02 REFERENCES

The switchboards and overcurrent protection devices referenced herein shall be designed and manufactured according to latest revision of the following specifications:

A. ANSI/NFPA 70 - National Electrical Code (NEC).
B. ANSI/IEEE C12.1 - Code for Electricity Metering.
C. ANSI C39.1 - Electrical Analog Indicating Instruments.
D. ANSI C57.13 - Instrument Transformers.
E. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
F. NEMA KS 1 - Enclosed Switches.
G. NEMA PB 2.2 - Application Guide for Ground Fault Protective Devices for Equipment.
H. UL 50 - Cabinets and Boxes
I. UL 98 - Enclosed and Dead Front Switches
J. UL 489 - Molded Case Circuit Breakers
K. UL 891 - Dead-Front Switchboards
L. UL 943 - Ground Fault Circuit Interrupters
M. CSA 22.2 No. 5 - M1986 Molded Case Circuit Breakers
N. Federal Specification W-C-375B/Gen - Circuit breakers, molded case branch circuit and service.

1.03 SUBMITTALS

A. Shop Drawings shall indicate front and side enclosure elevations with overall dimensions shown; conduit entrance locations an requirements; nameplate legends; size and number of horizontal bus bars per phase, neutral, and ground; one-line diagrams; equipment schedule; and switchboard instrument details.

1.04 QUALIFICATIONS

A. To be considered for approval, a manufacturer shall have specialized in the manufacturing and assembly of switchboards for at least twenty (20) years.

B. Furnish products listed and classified by Underwriters Laboratories Incorporated and in accordance with standards listed in Section 1.02.

A. Provide one (1) set of installation and maintenance instructions with each switchboard. Instructions are to be easily identified and affixed within the incoming or main section of the line-up.

1.06 WARRANTY

Manufacturer shall warrant equipment to be free from defects in materials and workmanship for the lesser of one (1) year from date of energization.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Shall be "Square D" Class 2742, QED-2, “Eaton” Pow-R-Line C Group-Mounted, or equivalent by “Siemens” or “ABB(GE)”.

2.02 SWITCHBOARD - GENERAL

A. Short Circuit Current Rating: Unless indicated otherwise on the drawings, switchboards shall have a minimum short circuit current rating of 65,000 in RMS symmetrical amperes at voltage specified.

B. Future Provisions: All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

C. Enclosure: Type 1 - General Purpose.

1. Align sections at front and rear.

2. Switchboard dimensions shall be as indicated on the drawings.

3. The switchboards shall be of deadfront construction.

4. The switchboard frame shall be of formed UL gauge steel rigidly bolted together to support all cover plates, bussing and component devices during shipment and installation.

5. Steel base channels shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.

6. Each switchboard section shall have an open bottom and an individually removable top plate for installation and termination of conduit.

7. The switchboard enclosure shall be painted on all exterior surfaces. The paint finish shall be a medium light gray, ANSI #49 and/or ANSI #61, applied by the electro-deposition process over an iron phosphate pre-treatment.

8. All front covers shall be screw removable with a single tool and all doors shall be hinged with removable hinge pins.

9. Top and bottom conduit areas shall be clearly indicated on shop drawings.

D. Nameplates: Provide 1"H X 4"W engraved laminated (Gravoply) nameplates for each device. Furnish black letters on a white background.

E. Bus Composition: Plated Copper.

1. Plating shall be applied continuously to all bus work. The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements. The phase and neutral through-bus shall have an ampacity as shown in the plans. For 4-wire systems, the neutral shall be of equivalent ampacity as the phase bus bar. Full provisions for the addition of future sections shall be provided. Bussing shall include all necessary hardware to accommodate splicing for future additions.

F. Bus Connections: Shall be bolted with Grade 5 bolts and conical spring washers. Welded connections are not acceptable.

G. Ground Bus: Sized per NFPA70 and UL891 Tables 25.1 and 25.2 and shall extend the entire length of the switchboard. Provisions for the addition of future sections shall be as outlined in Section 2.02.C.

H. Accessibility: Accessible from the front only for boards mounted against walls.

2.03 SWITCHBOARD - INCOMING MAIN DEVICES

A. Main Section Device(s):

1. Main Circuit Breaker(s):

a. Electronic trip current limiting molded case circuit breaker(s) – (shunt trip):

1) Individually mounted 1600A through 4000A.
Main circuit breaker(s) shall be fixed, individually mounted with capability of terminating conductors in size, material and quantity indicated on the Riser Diagram detailed on the drawings. Power terminals to accommodate either cable or bolted bus connections where required.

2. Equipment Ground Fault Protection

(a) Where required by National Electrical Code, provide an integral ground fault system. Ground fault detection shall be residual type sensing detection via circuit breaker electronic trip unit.

(b) The ground fault protection shall have adjustable pick-up for ground fault currents from 25-100% of breaker frame rating not to exceed 1200 amps.

(c) Direct adjustable time delay shall be provided by the ground fault protection with maximum delay of .5 second.

(d) Provide an integral means of testing the ground fault system to meet the on-site testing requirements of NEC article 230-95(c).

2.04 SWITCHBOARD - DISTRIBUTION

A. Distribution Section Devices:

1. Branch Circuit Breakers:

a. Electronic trip molded case circuit breakers:

1) Group mounted 15A through 1200A.

Provide thermal magnetic trip only type for 15A through 250A.

Branch circuit breakers shall be group mounted on a distribution chassis assembly.

Circuit breakers shall be mounted in the switchboard to permit installation, maintenance and testing without reaching over line side bussing.

The interior shall have three bus bars aligned horizontally, so insulators between phases are not required.

There shall be one (1) continuous bus bar per phase; each bus bar having specific mounting means for branch circuit breaker device connectors.

Circuit breakers shall not require additional external mounting hardware. Circuit breaker(s) shall be held in mounted position by a self-contained bracket secured by fasteners. Each individual circuit breaker shall be capable of being mounted independently.

Circuit breakers shall be capable of terminating feeder conductor sizes and quantities indicated on Panelboard Schedule detailed on the drawings. Large frames with trip modules shall be utilized if necessary.

A minimum of four (4) spaces for 3 pole, 400 amp frame circuit breakers shall be provided in each main switchboard.

2. Equipment Ground Fault Protection

a. Where indicated in the PANEL SCHEDULE, circuit breaker(s) shall be provided with integral equipment protection for grounded systems. The circuit breaker shall be suitable for use on three phase, three wire circuits where the neutral is grounded but not carried through the switchboard, or on three phase, four wire systems.

b. The ground fault system shall include a memory circuit for positive tripping action despite intermittent arcing ground faults.

c. The ground fault sensing system shall be of the residual type.

d. Provide an integral means of testing the ground fault system to meet the on-site testing requirements of NEC article 230-95(c).

e. Provide a separate neutral current transformer for three phase, four wire systems as shown.

2.05 ELECTRONIC TRIP SYSTEM

A. The integral trip system shall be self-powered and shall contain electronic components to measure ampacity, time the output from internal current sensors and initiate automatic tripping action.

B. The entire trip system shall be a microprocessor-based, true RMS sensing design with sensing accuracy through the 27^{th} harmonic.

C. The continuous ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the ampere-rating switch on the circuit breaker. The ampere rating resulting from the rating plug/sensor/switch combination shall be clearly marked on the front of the circuit breaker.

D. Provide a means to seal the rating plug and trip unit adjustments to discourage unauthorized tampering in accordance with NEC 240-6.

E. Provide the following time/current curve profile adjustments to maximize system selective coordination. Each adjustment shall have discrete settings and shall be independent from all other adjustments.

1. LSI - Adjustable Long Time Ampere Rating and Delay - Adjustable Short Time Pickup and Delay (delay includes I^2t IN and I^2t OUT) - Adjustable Defeatable Instantaneous Pickup (with "OFF" position) - High Level Selective Override

F. The trip system shall include a long time memory.

G. Provide magnetic/thermal backup for all electronic trip circuit breakers.

H. Circuit breakers feeding panelboards that serve A/C equipment shall be shunt trip type and have all equipment required to provide single phasing protection. If one service phase fails, each breaker shall trip immediately upon phase failure. Phase monitor shall have adjustable time delay and pickup point. Phase failure equipment shall be rated to operate size and quantity of shunt trip circuit breakers required, as indicated on the drawings.

2.06 METERING

A. Board shall have amp, voltage and power factor metering for all phases.

2.08 ALLOWANCE

A. Allow for one (1) 3 pole, 400 amp or less circuit breaker to be provided in each main switchboard when directed. If not directed during building construction, Contractor shall install one (1) 3 pole, 225 amp spare in each main switchboard.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install main switchboards on 4” concrete base with #4 rebar 12” on centers and with 1” bevel on all edges. Base shall extend 6” beyond switchgear.

3.02 EXTERIOR SHUNT TRIP OPERATOR

A. Install a "Knox" box as specified in the Architectural Specifications, complete with tamper circuit to alarm system and a "Knox" #4505 remote power box to operate the main circuit breaker shunt trip. Verify exact required location of these devices with the local fire marshal and install in location as directed. NOTE: This may be at main entry to building and/or at other location.

B. Provide 120 volt circuit as required and install shunt trip circuit for main circuit breakers to shunt trip switch. Label box clearly with engraved nameplate – "ELECTRICAL POWER SHUT-OFF", and with building address.

3.03 FINAL SETTINGS

A. Final settings for equipment ground fault protection at main circuit breaker(s) shall be provided by Contractor per manufacturer’s recommended specifications. If specific settings are not able to be obtained from manufacturer, Contractor shall set adjustable pick-up current to 600 amps and adjustable time delay to 0.4 seconds.

END OF SECTION

SECTION 26 2414

POWER FACTOR CORRECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions and the sections included under Division 1, General Requirements, and of Sections 26 0100 are included as part of this section as though bound herein.

1.02 SUMMARY

A. The Contractor shall furnish the equipment, accessories, and necessary material for a complete system as indicated on the drawings and described herein.

B. This specification contains the minimum requirements for the design, manufacture and testing of automatic, three phase, harmonic filters rated 480 volts.

1.03 SUBMITTALS

A. Shop drawing submitted in book form, for review:

1. Provide manufacturer's catalogue cuts.
2. Provide the following drawings:
    a. Outline
    b. Internal Assembly
    c. Power Wiring
    d. Control Wiring

1.04 QUALIFICATIONS

A. Capacitors shall be approved by Underwriters' Laboratories, and shall meet national, state and local requirements.

B. The equipment covered by these specifications shall be designed and tested in accordance with the latest standards of NEMA, NEC, IEC, IEEE and ANSI. The equipment shall be U.L. and cUL approved.

1.05 WARRANTY

A. The system is to be left in first class operating condition and the Contractor is to warrant equipment for a period of one (1) year from date of substantial completion against defective materials, design, and workmanship.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Approved Manufacturer: "G.E." Ultravar, or equivalent by "Power Survey", "Square D", "Eaton", "Siemens" or "(ABB)GE".

B. Other manufacturers will be considered upon review. Refer to Specification Section 01 2500 for product substitution requirements.

2.02 ENCLOSURE

A. The enclosure shall be NEMA 1 with 12-gauge steel frames and 14-gauge panels. The finish shall be ANSI 70 light gray. The enclosure shall have a pad-lockable door handle and stainless steel hinges. It shall be designed for convection cooling. Each 25" wide enclosure module shall be equipped with four (4) lifting eyes.

B. Components shall be mounted in a free-standing, front accessible enclosure, single 33" wide module.

C. All bus shall be tin-plated copper and braced for 75KAIC.

2.03 CAPACITORS

A. The voltage rating of the harmonic filters shall be 480 volt.

B. The nominal voltage rating of the capacitor cell shall be 1.08 times the voltage rating of the equipment.

C. Provide one (1) harmonic filter bank at 200 KVAR. The enclosure shall include capacitors and reactors.

D. The total KVAR shall be automatically switched in steps of 50 or 100 KVAR.

E. The automatic filter banks shall be modular in design to match new switchgear. The filter bank shall have provisions for expansion by utilizing additional 25" wide x 35" deep x 90" high modular cabinet enclosures.

F. The filter shall be tuned to the 4.7^{th} harmonic (282 Hz).

2.04 CAPACITOR CELLS

A. Individual capacitors shall be self-healing utilizing low loss metallized polypropylene dielectric film.

B. Each three phase capacitor shall be furnished with a UL listed pressure sensitive interrupter.

C. Capacitors shall be contained in a hermetically sealed heavy-gauge, cold-rolled steel welded case with UL-recognized ANSI #70 enamel overcoat with zinc rich primer to inhibit atmospheric contaminants from shortening design life.

D. Dielectric materials shall be low loss, less than 0.2W per KVAR.

E. Dielectric fluid shall be non-PCB biodegradable and environmentally safe.

F. Terminals shall be heavy duty ½ - 13 solid brass threaded studs plated for corrosion resistance with fluted ceramic bushings rated 30 kW BIL or greater. Torque ¼ - 20 studs a maximum of 20 inch-pounds and ½ - 13 studs to 160 inch-pounds maximum.

G. Nominal design life of individual capacitor cells shall be 20 years.

H. All capacitor cells shall have threaded terminals for wire connection.

I. Capacitor cells shall be designed to handle the increase in voltage from the reactor.

J. Temperature: -40 degree C to +46 degree C (-40 degree F to +115 degree F).

2.05 REACTOR

A. The reactor shall be tuned to the 4.7^{th} harmonic (282 Hz).

B. The laminated silicon steel iron core reactor shall have 100 percent copper windings.

C. The insulation construction shall be Class H, 180 degree C minimum.

D. The reactor shall be designed with open frame construction, vacuum impregnated with an epoxy base varnish.

E. Sound level 45 dB or less.

F. The reactor shall include a 145 degree C normally-open thermostat in center phase winding.

G. Inductance tolerance +/-5%.

H. Suitable for a maximum ambient temperature +40 degrees C.

I. Rated thermal current approximately 150% of rated capacitor current.

J. Saturation current = 400 to 500% of rated capacitor current.

K. Maximum temperature rise 115 degree C (includes the sum of harmonic and fundamental currents).

L. Hi pot voltage of 4000 Vac for one (1) minute.

M. Inductance unbalance between any two phases, less than .025. (Where unbalance is defined as: [L (max) – L (min)] / L (min).

2.06 CONTROLS

A. All controls shall be mounted on enclosure door for easy inspection and service.

B. All electrical door interlock shall be provided to prevent entry while the system is energized.

C. A personal ground fault breaker shall be provided to disconnect control power upon accidental contact with control power and ground.

2.07 REACTIVE POWER CONTROLLER/VAR SENSING CONTROLLER

A. The microprocessor-based controller shall have built-in voltage, temperature and harmonic alarms to provide safe and rapid indication of potential or real failure and have menu driven programming.

B. Controller shall measure the reactive current on every passage of the voltage through zero.

C. An LED display shall be provided to indicate the stages that are on.

D. The controller shall have a digital display of power factor (with indication of leading or lagging), system current and capacitor step status.

E. To prevent leading power factor, the controller shall be provided with a programmable target cosine selector.

F. The reconnection time delay between switching of filtered steps must be field programmable and have a range of 10 to 900 seconds to reduce hunting and allow voltage decay as required by NEC.

G. All output contacts shall be disabled within 15 milliseconds of main power interruption. The controller shall retain its programming after the restoration of supply voltage. The controller shall bring the capacitor bank on-line in a step, phased, normal sequence.

H. Controller shall be able to select 1:1:1, 1:1:2, and 1:2:2 switching sequence of filter steps. Additionally it should be programmable to allow sequential stepping or non-sequential rotation of capacitor stages.

I. The controller shall have automatic search for C/K values.

J. the controller shall have automatic CT polarity retrieval.

K. The controller shall release all steps at voltage dropout.

L. The controller shall have a normally-open dry contact, 0.3A, 110 volt available for an alarm.

M. The controller shall have voltage THD measurement and alarm.

N. The controller shall have capacitor over current measurement and alarm.

O. The controller shall have measurement and alarm of low capacitor output.

P. The controller shall have a hunting alarm for narrow C/K range.

Q. The controller shall be programmable to control the status of each step as being: "AUTOMATIC", "FIXED ON", or "FIXED OFF".

R. The controller shall have an over-temperature alarm.

2.08 BLOWN FUSE LIGHTS

A. Three (3) blown fuse lights, one per phase per capacitor door mounted, to indicate a blown fuse condition. Lights should be marked with appropriate stage number to facilitate maintenance.

2.09 DISCHARGE RESISTORS

A. Capacitor "cells" shall be provided with discharge resistors to reduce residual voltage to less than 50V with one (1) minute of de-energization (N.E.C. Article 460-6).

B. Resistors shall be chosen to insure a 20-year minimum life.

2.10 FUSES

A. To provide for major fault protection, line fuses shall be provided on all three phases of each switched stage and fixed bank.

B. Fuses shall be UL recognized, specifically designed for capacitor applications and shall be rated 600 VAC, 200 KAIC.

2.11 PERFORMANCE FEATURES

A. The capacitor shall be rated for continuous duty at 40 degrees C ambient at 3300 feet (1,000 meters) and below.

B. Total Harmonic Distortion (THD) of 5 percent on either the voltage and current waveforms shall not affect the life of capacitors, contactors, or controller.

C. A +/-10 percent variation in line voltage shall not affect the life of the capacitor.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Document power factor correction by field measurement using calibrated power analysis metering equipment. Testing should include the following parameters: voltage, current, ground current, imbalance, frequency, power quality (sags, swells and impulses), power consumption (energy demand, P.F., reactive power), harmonics (up to the 62nd harmonic) and flicker. Metering should be accomplished when the facility is operating under normal conditions and normal running loads. The metering results should reflect four (4) hours with the harmonic filters off-line and four (4) hours with the harmonic filters on-line. The equipment manufacturer trained representative should make these measurements. Three (3) copies of the completed test reports shall be forwarded to the Engineer.

B. The equipment shall be bolted to the floor.

C. KVAR values as may be indicated on the drawings are for estimating purposes and shall be adjusted as needed to match equipment actually furnished, in compliance with NEC Article 460-6.

3.02 TESTING

A. All capacitor cells shall be traceable through construction and testing.

B. The automatic filter bank shall be tested for proper operation prior to leaving the factory. The following checks, measurements, and operations must be confirmed and recorded for each stage.

C. Manufacturer shall have the ability to furnish records of the following final tests if desired:

1. Wire connections
2. Torque connections
3. Hi-Pot phase-to-phase
4. Low voltage circuit and capacitor fuses
5. Phase-to-phase, capacitance checks
6. Controller operation, manual and automatic modes

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

The work included under this section of these specifications consist of the furnishing of all material and equipment and in the performing of all labor and services necessary for the complete installation of electrical panelboards and accessories for the building, all as shown on the drawings and hereinafter specified.

PART 2 - PRODUCTS

2.01 FABRICATION – LIGHTING AND APPLIANCE PANELBOARDS

A. The panelboards shall be of the dead-front type and shall be in accordance with Underwriters' Laboratories, Inc. standard for panelboards and enclosure cabinets, and so labeled.

B. Panelboards shall be designed for connection to the voltage indicated, and service connection made at the top or bottom as indicated on the plans. The neutral bar (solid neutral) shall be mounted in the wireway gutter for connection of neutral wires. Where applicable, the panelboard shall meet requirements of and be marked as suitable for service entrance rated.

C. Each panelboard box shall be fabricated from galvanized sheet steel. A turned edge shall be provided around the front of the box for rigidity and attachment of the front. Wiring gutters shall be in accordance with the National Electrical Code.

D. Each panelboard front shall feature “door-in-door” construction consisting of a flat piece of sheet steel, with an opening to which each panelboard door is attached by means of semi-concealed hinges. The doors shall have a cylinder tumbler type lock. On doors more than 48" high a combination three-point catch and lock shall be provided. A framed circuit directory shall be provided on the inside of the door. Plastic stick-on covers are not acceptable. Circuit breakers shall be consecutively numbered left to right for entire panelboard. Locks to all doors shall be keyed alike. Fronts shall be finished in gray enamel over a rust inhibitor, and shall be designed for flush or surface mounting as indicated on the plans.

E. Interiors shall be of the unit type, mounted on a back plate, properly reinforced by flanging providing a rigid assembly to protect against damage during handling or installation. Structures shall be so designed that units may be easily removed without disturbing adjacent units, bus structure, or insulation. A removable dead-front shield shall be provided for easy access to the wiring. Panel busing shall be arranged to maintain sequence phasing throughout, that is, adjacent poles shall be on unlike polarity and rotated in sequence.

F. Enclosure type shall be of the NEMA type required to meet the application and environmental conditions in which installed. Refer to drawings for specific requirements.

2.02 LIGHTING AND APPLIANCE PANELBOARDS

A. Approved manufacturers for branch circuit panelboards shall be "Square D", “Eaton”, “Siemens” or “ABB(GE)”.

B. For circuits 15 amp and larger, “bolt-on” type only circuit breakers shall be used. Breakers shall be assembled into a single interior unit which shall be mounted in a painted sheet-steel enclosure consisting of a box and front designed to be placed in or against a wall or partition.

C. The mains of each panelboard shall have copper bus and be provided with main lugs only, or a main circuit breaker as indicated on the plans, and with solderless lugs. Mains shall not be smaller than 100 amperes or larger than 400 amperes. All ratings shall be based on continuous load. All panelboards shall have a copper insulated equipment ground bar.

D. Branch circuit-protective devices shall be of the molded case circuit breaker type consisting of the number of poles, ampere ratings, and interrupting rating as listed on the drawings. Series type ratings shall not be allowed. All breakers shall be fully rated.

E. The breakers shall have quick-make and quick-break toggle mechanism inverse-time characteristics, and shall be trip-free on overload or short circuit. Automatic release is to be secured by a bimetallic thermal element, releasing the mechanism latch. In addition, a magnetic armature shall be provided to trip the breaker instantaneously for short-circuit currents above the overload range. Automatic tripping shall be indicated by handle position between manual OFF and ON position.

F. Multiple-pole branch circuit breakers shall be common-trip type. Breakers used for air conditioning equipment shall have HACR rating.

G. The individual breakers shall be calibrated and sealed to eliminate tampering or unauthorized changes in calibration. Breakers shall be interchangeable and capable of being operated in any position.

H. All circuit breakers that serve kitchen equipment and are located under exhaust hoods, including hood fans, shall be shunt trip type.

2.03 FABRICATION – POWER DISTRIBUTION PANELBOARDS

A. Approved manufacturer for power distribution panelboards shall be "Square-D", “Eaton”, “Siemens” or “ABB(GE)”.

B. Interior:

1. Shall be 240 VAC or 480 VAC as indicated, continuous main current ratings through 1200 amperes.

2. Provide short circuit current ratings as indicated on the drawings. U.L. listed series connected ratings shall not be allowed. Provide fully rated breakers.

3. Bussing shall be plated copper. Equipment ground bus shall be copper insulated.

4. Panelboard shall be furnished with a wiring space of equal width on both the left and right side of the breaker mounting space. Minimum width of wiring space shall meet or exceed the minimum U.L. wiring space required for the largest breaker scheduled.

5. Panel depth for all panelboards in excess of 800 amp bus rating shall be a minimum of 11" deep.

C. Molded-Case Circuit Breakers:

1. Breakers shall have the common characteristics listed under Paragraph 2.01 above.

2. Circuit breakers shall not require any additional external or internal mounting hardware. Circuit breakers shall be bolted in place. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.

D. Enclosure shall be NEMA Type 1 indoor. Refer to Paragraph 2.1 above for general characteristics.

E. Provide the following spare (loose) circuit breakers for power distribution panelboards to be installed as directed: one (1) each of the following size breakers in 480 volt and one (1) each in 208 volt – 3 pole-100 amp, 3 pole-70 amp, 3 pole-30 amp. These breakers are to be utilized for equipment where directed or if not utilized, shall be installed as spare units in distribution panelboards.

F. All distribution panelboards shall have a minimum of four (4) 3 pole, 225 amp spaces available for future circuit breaker installation.

2.04 BIDDING REQUIREMENTS FOR PANELBOARDS

A. Manufacturers, distributors and contractors shall thoroughly review the following items before bidding to insure compatibility:

1. Panelboard schedules
2. Electrical riser diagram
3. Specifications
4. Electrical drawings in general

B. Report any exceptions or inconsistencies to the Architect prior to bidding.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install panelboards in location indicated on the plans. Verify exact location before installation. The Architect reserves the right to move any panelboard a maximum distance of 8' if required to prevent interference with other systems. Check all "A", "M" and "S" drawings for interference before roughing-in panel feeder conduits.

B. Circuit designation cards shall be neatly typed to indicate loads served except the word “spare” shall be penciled in with soft pencil to allow future typing. Refer to Section 26 0100, Paragraph 1.20, for additional requirements.

C. Panels shall have clear space above and below panelboard equal to panelboard dimensions from floor to ceiling. Clear space on each side of panel shall be 12" and clear area in front shall be 48". No piping, ductwork, etc. shall run through these clear spaces.

D. All circuit breakers that serve kitchen equipment and are located under exhaust hoods, including hood fans, shall be shunt trip type connected to the hood fire extinguishing system to turn off breaker when extinguishing system is activated.

E. Refer to ELECTRICAL SPECIAL PROVISIONS - SECTION 26 0100 for nameplate requirements.

3.02 LOAD BALANCE

A. Contractor shall check all panel loads after project is essentially complete. Phase loads should not vary by more than ten percent (10%). Where phase load balance exceeds ten percent, Contractor shall change circuits from the high load phase to the low load phase as required to obtain an acceptable phase load balance. When rebalance is required, Contractor shall revise the panel schedule sheet to reflect correct circuit numbers.

3.03 SPARE CONDUIT

A. Provide one (1) 1” spare conduit from all recessed panelboards to above ceiling terminating in 4/S junction box with cover marked “SPARE”. Install one (1) 1” conduit for each ten (10) spare breakers in panel. Three pole breakers shall count as three breakers.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. This section comprises wiring devices and related items.

PART 2 - PRODUCTS

2.01 SWITCHES

A. Switches shall be heavy-duty industrial grade, nylon toggle, back and side-wired, and meet NEMA-WD-1 and 6 Standards.

B. Switches shall be white.

C. 20 ampere, single pole, 120/277 volts - #1221-2I.

D. 20 ampere, two pole, 120/277 volts - #1222-2I.

E. 20 ampere, three way, 120/277 volts - #1223-2I.

F. 20 ampere, four way, 120/277 volts - #1224-2I.

G. 20 ampere, key switch where indicated shall be same as part number above, except with “L” suffix.

H. Special type switches as indicated on the drawings.

I. Approved Manufacturer: "Leviton", “Hubbell”, “Pass & Seymour” or “Cooper”, with stainless steel cover plate.

2.02 RECEPTACLES

A. Receptacles shall be commercial specification grade, side-wired and meet NEMA-WD-1 & 6 Standards.

B. Receptacles shall be white, except for those served from Technology (“T-“) Panels, which shall be gray.

C. General-use 20 ampere, 125 volts - duplex - NEMA 5-20R; equivalent to “Leviton” CR20 Series.

D. 30 ampere, 125/250 volt dryer receptacle - NEMA 14-30R with matching plug.

E. Kitchen equipment receptacles to match equipment plug.

G. Interior NEMA 5-20R G.F.C.I. receptacles shall be equivalent to “Leviton” N7899 Series and tamper-resistant type shall be equivalent to “Leviton” X7899 Series.

H. All NEMA 5-20R non-locking receptacles installed in damp or wet locations shall be tamper-resistant, weather-resistant GFCI type, equivalent to “Leviton” WT899 Series.

I. All non-locking 125 volt 20 ampere receptacles in elementary schools shall be listed tamper-resistant type.

J. Approved Manufacturer: "Leviton", “Hubbell”, “Pass & Seymour” or “Eaton Arrow Hart”, with cover plate.

2.03 PLATES

A. Provide plates on all devices and wall outlets of type designed for specific application and specially formed where required for round or irregular surfaces.

B. Plates shall be nylon (of color matching device).

C. Exterior outlets shall have while-in-use cast aluminum weatherproof covers listed and identified for “extra-duty” use, equivalent to “Hubbell” WP26MH.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install wiring devices and plates after construction is complete and protect during painting and other finishing. Devices and appliances found damaged, marred, or paint splattered shall be cleaned, repaired or replaced.

B. Furnish and install device plates on every outlet box of the type required for the service involved.

C. All receptacles in locations that require ground fault interruption by the National Electrical Code shall be installed with that protection whether such protection is indicated or not.

D. All 20 amp single phase, 125 volt receptacles installed in restrooms, kitchens, locker rooms, garages or any other wet location shall be G.F.C.I. protected.

E. All receptacles serving technology power outlets, fire alarm devices, security panels, HVAC control circuits, telephone equipment, public address, and all circuits (except “convenience” power receptacles) in MDF and IDF rooms shall be served by technology power (“T-“ Series) panels.

F. Install a weatherproof G.F.C.I. protected 20 amp 125 volt receptacle outlet within 25' and on the same level of all HVAC equipment for service and maintenance purposes. The receptacle shall be served from a circuit separate from HVAC equipment circuit.

G. Install a 20 amp 125 volt receptacle within fifty feet (50’) of electrical service equipment.

H. Provide adhesive label centered at top of faceplate of each receptacle indicating circuit number (e.g., “L1-14”).

3.02 ADDITIONAL DUPLEX RECEPTACLES AND POWER/DATA OUTLETS

A. Contractor shall allow for four (4) additional dedicated receptacles and four (4) additional power/data outlets that are not indicated on the drawings. Base each dedicated receptacle on a 100 ft. run of ½” conduit with two (2) #12 THWN and one (1) #12 green ground. Install as directed at the job site. These circuits may be utilized for miscellaneous hard-wired equipment when directed by the Architect.

END OF SECTION

SECTION 26 2813

FUSES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This section specifies the furnishing and installation of low voltage cartridge fuses rated 600 volts and below plus accessory items.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to the work of this section.

B. Refer to other Division 26 sections for the following items:

1. Electrical Special Provisions
2. Enclosed Switches

1.03 REFERENCES

A. ANSI/IEEE C97.1 "Standard for Low Voltage Cartridge Fuses, 600 Volts and Less".

B. ANSI/UL 198.2 "High Interrupting Capacity Current Limiting Fuses".

C. NEMA FU1 "Low Voltage Cartridge Fuses".

D. UL 198-C "Class L and Class J Fuses".

1.04 SUBMITTALS

A. Submit manufacturer's product data in accordance with Conditions of Contract and Division 1 Specification Sections. Product data for fuses and accessories must include descriptive and dimensional data, time-current curves, and let-through curves.

1.05 SPARE PARTS

A. Spare fuses shall be provided in the amount of one (1) fuse for every ten (10) of each type and size installed. For 60 amps and less, provide no less than six (6) each. For 61 amps and above, provide no less than three (3) each. Provide a properly labeled spare fuse cabinet equivalent to "Bussman" Type SFC.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. "Cooper Bussman", “Littelfuse” or “Mersen”.

2.02 MATERIALS

A. General: Provide fuses of the type, ampere rating, and voltage rating as required. All fuses shall be UL listed and shall be of the same manufacturer.

B. Types:

1. 600 Amps and Below: Class J, dual-element time delay. Interrupting rating shall be 300,000 amperes RMS. Fuses shall be Low-Peak, LPJ (amp) SP. The fuses shall have separate overload and short-circuit elements and incorporate a spring-activated thermal overload element which is independent of the short-circuit clearing chamber.

PART 3 - EXECUTION

3.01 APPLICATION

A. Motor Circuits: The fuses shall be applied for all motors protected by properly sized overload relays. LPJ-(amp)SP fuses shall be installed in ratings of 115% of motor full-load current (or next size larger if this does not correspond to a fuse size), except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuses may be sized at 175% of the motor full-load current, or the next size larger if 175% does not correspond to a standard fuse size.

B. Fusible disconnect switches at air conditioning units shall have fuses installed as indicated on the drawings.

3.02 INSTALLATION

A. General: Fuses shall be shipped separately. All fuses shall be stored in moisture-free packaging at job site and shall be installed immediately prior to energizing the circuit in which it is applied. Fuses shall be new -- used fuses are not acceptable.

B. Equipment Labels: "Low-Peak Yellow" notice labels, to alert the end user of the engineered level of protection of the electrical equipment shall be field-installed by the Electrical Contractor. They shall be marked with the proper fuse rating per the specifications, and placed in a conspicuous location on the enclosure. These labels are available with the spare fuse cabinet (SFC) and are also available from the fuse manufacturer at no charge.

C. Fuse Clips: Check fasteners on fuse clips for tightness when installing fuses. Provide fuse reducers where fuse clips are larger than the fuse. Use only Class J fuse reducers as applicable. Class H reducers are not acceptable.

D. Labels: Where possible, install fuses so label is in an upright, readable position. Fuses without labels are not acceptable.

E. Spare Fuse Cabinet: Install spare fuse cabinet on the wall in main electrical room or other approved room unless shown otherwise on the drawings. Store spare fuses in cabinet and lock. Give key to Owner at time of project acceptance.

END OF SECTION

SECTION 26 2816

ENCLOSED SWITCHES

PART 1 - GENERAL

1.01 SUMMARY

Furnish all materials, equipment and all labor and services necessary for complete installation of disconnect switches.

PART 2 - PRODUCTS

2.01 DISCONNECT SWITCHES

A. Disconnect switches shall conform to the governing industry NEMA Standards and shall be listed by Underwriters' Laboratories, Inc.

B. Switches shall be "heavy duty" front or side operated, single throw, quick-make, quick-break type horsepower rated for not less than 240 volts for double pole switches and not less than 600 volts for 3 pole switches. Switches shall be fused with standard fuse clips or unfused as required, and shall be furnished with general purpose NEMA Type 1 enclosures, except that switches installed outside the building or otherwise exposed to the weather shall be provided with raintight NEMA Type 3R enclosures. Raintight enclosures shall be equipped for releasable cover interlock. All switches shall be designed for locking in "on" or "off" position.

C. Switches shall be as manufactured by "Square-D", “Eaton”, “Siemens” or “ABB(GE)”.

D. Where utilized as service disconnect, disconnect switch shall be “service entrance” rated with adequate neutral and ground bus assemblies.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install a disconnect switch at all locations required by the National Electrical Code and at all locations indicated on the plans. Switches shall have a minimum of 48" clear space in front.

B. NEMA 3R switches shall have weatherproof threaded hubs for all conduit entries into switch.

C. All switches shall be identified, as to equipment served, horsepower and circuit number with bolted on 1/16” thick phenolic plastic plates. Refer to SECTION 26 0100 ELECTRICAL SPECIAL PROVISIONS for additional requirements.

D. Switches mounted on HVAC equipment shall not be mounted to removable access panels or cover unit nameplates. Switches shall be installed in locations approved by manufacturer as coordinated with Mechanical Contractor.

END OF SECTION

SECTION 26 4313

SURGE PROTECTION DEVICES FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This section covers surge protection devices (SPD) for low-voltage electrical power circuits. These devices shall be suitable for use as Type 1 or Type 2 devices per UL1449 3rd Edition, applied to the line or load side of the utility feed inside the facility.

PART 2 - PRODUCTS

2.01 SURGE PROTECTION DEVICES (SPD UNITS)

A. Unless shown otherwise on the drawings, provide the following surge protection devices at the locations designated. Refer to drawings for exact quantity, location, voltage, phase and surface or flush configuration requirements.

B. Heavy duty surge protector to be installed at main service panel shall be “Southern Tier Technologies” T45277Y200ADAM1S with audible alarm, dry contact relays, LED indication and integral disconnect option or equivalent by “Current Technology” SL3 Series or “Asco” 460 Series.

C. Medium duty surge protector for distribution panelboards serving computer/data distribution panels shall be “Southern Tier Technologies” T45120Y150ALAM2S with audible alarm dry contact relays and LED indication or equivalent by “Current Technology” SL3 Series or “Asco” 460 Series.

D. Surge protectors for branch panels serving computer/data equipment shall be “Southern Tier Technologies” T45120Y100AWAJ2S or equivalent by “Current Technology” TG3 Series, or “Asco” 460 Series.

E. Minimum requirements for other products to be considered:

1. Equipment shall be Southern Tier Technologies T45 Series, or approved equivalent by “Current Technology” or “Asco”.

2. Minimum Values	Main	Distrib.	Branch
Single Surge Capacity (Amps)/Per Mode	200,000	160,000	80,000
Repetitive Surge Current Capacity (Impulses)	6,500	5,500	4,000
UL1449 (3rd Ed.) Voltage Protection Rating L-N	1000/1000	700/700	700/700
EMI-RFI Noise Rejection Max. Values	63 DB	63 DB	63 DB

3. Each MOV suppression component shall be individually thermally fused.

4. Unit shall have a written minimum seven (7) year replacement warranty, including lightning damage. Main service and distribution panel SPD warranty shall include a minimum of five (5) years of labor.

5. Equipment, where applicable, shall meet the following standards:

   UL 1449 3rd Edition (2009 Revision)
   UL 1283, 5th Edition
   ANSI/IEEE C62.45-2002
   ANSI/IEEE C62.41-2002
   IEEE 1100 Emerald Book
   NFPA 70 (National Electrical Code)

6. Catalogue numbers appear on the drawings to clarify location of various models.

7. Device shall maintain a minimum of a NEMA 12 rating on the enclosure for indoor locations, and minimum of a NEMA 4 rating for outdoor locations.

PART 3 – EXECUTION

3.01 START-UP TESTING

A. Upon completion of installation, a factory-certified local service technician shall provide testing services. The following tests shall be performed: (a) voltage measurements from line-to-ground, line-to-neutral, line-to-line and neutral-to-ground at the time of the testing procedures, (b) impulse injection to verify the system suppression voltage tolerances for all suppression paths, and (c) frequency of voltage on ground cables at each separately derived ground system at the transformers (if applicable). Testing shall be completed while the unit is off-line to isolate the unit from the distribution system. Test results shall be recorded and compared to factory benchmark test parameters supplied with each unit. A certified copy of the start-up test results and the factory benchmark testing results signed by the Factory Technician, Electrical Contractor and General Contractor shall be supplied to the Engineer and the Owner for confirmation of proper suppression filter system function. In addition, this letter shall certify that the integrity of all dry-type transformer X-O neutral-to-ground bonds (if applicable) was verified through testing and visual inspection, and that all grounding bonds were observed to be in place.

B. Install circuit breaker in panelboards as/if required for surge protection devices (SPD). SPD installed at main service panel shall connect directly to panel bus without use of circuit breaker. Install surge protectors adjacent to panelboards so that conductor length is limited to no more than 10'-0". Flush-mounted panels require flush-mounted surge protectors. Coordinate installation with Panelboard Schedule. Install and connect surge protectors per manufacturer's recommendations.

END OF SECTION

SECTION 26 5113

LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide fixtures complete; factory wired, assembled and furnished with necessary light sources, reflectors, diffusers, lenses, louvers, and plates, drivers, boxes, hangers, frames, stems, hickeys, canopies, locknuts, and study for a complete workable lighting system.

B. Provide a fixture or fixtures at each outlet, by type designation, as shown on the drawings.

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURES

A. Fixture types are indicated on the drawings by symbol.

B. The types and their descriptions are listed on the "LIGHTING FIXTURE SCHEDULE" on the drawings.

C. Fixtures are specified in the schedule by manufacturer's name and catalogue number to establish a Basis of Design. Fixtures by other manufacturers listed, which are similar and equivalent with respect to quality of materials, components, and construction, light characteristics and physical size, shape and appearance, may be submitted for approval. Refer to ELECTRICAL SPECIAL PROVISIONS, SECTION 26 0100 for requirements and limitations.

D. Manufacturers Pre-Approved for this Project: "Columbia", “Metalux”, and “Lithonia” for general type. Submittal required. Refer to Lighting Fixture Schedule notes on the drawings.

E. Associated and specialty fixtures represented by the agency of the pre-approved manufacturers may also be utilized. Fixtures that are more functional than aesthetic may be supplied as long as the performance and construction is comparable to the specified fixture. Specialty fixtures (those that have aesthetic value to the architectural scheme – sconces, pendants, pole fixtures, etc.), shall very closely match the specified fixtures. These may be submitted for pre-approval to assure acceptance on formal submittal.

2.02 EMERGENCY POWER PACK

A. Units shall power fixture at a minimum of 1300 lumens for ninety (90) minutes with instantaneous and completely automatic operation; sealed nickel-cadmium batteries with solid-state charging system with test switch and pilot light. Unit shall be “Bodine” BSL Series or approved equivalent.

B. Units for can light fixtures shall power fixture at a minimum of 900 lumens.

C. All fixtures with emergency power packs shall have red light identification for maintenance purposes.

2.03 SUBMITTALS

A. Submittals for light fixtures shall include detailed specifications and data.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide necessary mounting frames, supports and related items required to properly install fixtures.

B. Reference all mechanical drawings and architectural reflected ceiling plans for ductwork, pipes, and final location of each fixture shown. Where lighting fixtures are shown to conflict with locations of structural members and mechanical or other equipment, provide adequate supports and wiring to clear it.

C. Support ceiling-mounted fixtures from building structural system with hangers designed for that purpose. Do not support fixtures from finished ceiling system or material. Each lay-in fixture shall be supported with support wires from two (2) opposite corners of fixture to structural system.

D. Replace all inoperable LED's or drivers prior to final review.

E. Coordinate installation of lighting in gymnasium and other exposed areas with structure, ductwork, etc., and adjust as required.

F. Overhead lighting in gymnasium shall have a 400 pound rated safety chain and/or cable secured to structure with all fixture parts such as housing, reflector assembly, glass door and wireguard securely attached. Shop drawings shall clearly indicate the chain or cable, rating in pounds and securing technique at each fixture piece.

3.02 CLEANING

A. Clean all lighting equipment after lighting installation, general construction and finishing is completed, prior to final acceptance of building. Utilize a solution of 70% rubbing alcohol and 30% water with a soft cloth.

3.03 ALLOWANCE

A. Contract shall allow for six (6) Type "A", four (4) Type "E", four (4) Type "EM1", two (2) Type "F", and three (3) Type "X" exit light fixtures installed with circuit wiring as required that are not indicated on the drawings, including two (2) switches and circuit to be installed as directed at the job site.

END OF SECTION

SECTION 26 6620

ELEVATOR ELECTRICAL SUPPORT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SCOPE

A. The Contractor shall furnish all equipment, material, labor, supervision and services necessary for, or incidental to, the electrical support for an elevator as shown or indicated on the drawings and/or specified herein or otherwise required by the elevator supplier.

B. Provide all fire alarm devices, required by Code to integrate elevator and elevator controls with building fire alarm system.

1.03 REFERENCE STANDARDS AND CODES

A. Except as modified by this specification, conform to the applicable provisions and recommendations of the following standards:

1. National Electrical Code (NEC)
2. National Fire Protection Association (NFPA)
3. State of Texas Elevator Code
4. Local Elevator Codes
5. ANSI A17.1
6. International Building Code

B. Comply with all requirements of City Fire Codes (if any).

PART 2 - PRODUCTS

2.01 GENERAL

A. Fire alarm system and other equipment are specified in other sections of this specification.

2.02 WATER DETECTION SYSTEM

A. Provide a water detection system for the elevator pit. System shall be “Dorlen Products Inc.”, Model #SS-1 with #PS-3 power supply and all required accessories.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS – UNLESS OTHERWISE REQUIRED BY ELEVATOR CODES OR ELEVATOR SUPPLIER, PROVIDE THE FOLLOWING:

A. Main elevator service feeder to terminate in power module fusible shunt trip switch as specified on the drawings and equivalent to “Cooper Bussman” PS Series. Size in accordance with elevator supplier’s requirements if different than sizes indicated on the drawings.

B. Machine Room lighting shall be served by a dedicated circuit and switched with a disconnect switch lockable in the “off” position.

C. Only such equipment directly required in the function or support of the elevator system is allowed in the Equipment Room or hoistway.

D. Install a light, switch, ground fault receptacle, and light fixture(s) in the elevator pit, all rated waterproof. Connect to dedicated circuit as indicated on the drawings. Install at locations and heights required by code.

E. Install a ground fault receptacle at midpoint of hoistway.

F. Unless otherwise required by codes, install a heat detector rated at 175^{o}-195^{o} (must be 25^{o} lower rating than sprinkler heads). Detector shall be installed within six inches (6") of each sprinkler head in machine room and hoistway and connected so that when its temperature rating is reached power to the elevator machinery is disconnected. Connect to elevator fire alarm system.

G. Provide a 2-pole, 20 amp fusible switch in Elevator Machine Room with dedicated 120/208 volt, 20 amp circuit for elevator controls. Coordinate with elevator supplier.

END OF SECTION

SECTION 27 0000
COMMUNICATION CABLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Related Documents: General and Supplementary Conditions of the Contract, Division 00 – Procuring and Contracting Requirement, Division 01 – General Requirements, and Drawings are applicable to this Section.

1.02 SUMMARY

A. Section includes
   1. Furnish and install a warranted and certifiably functioning telecommunications distribution system, complete with all accessories for the new project.
   2. Contractor is required to submit project documentation upon completion of installation. The documentation is essential for timely implementation of communication systems. Documentation includes copper and fiber test results and all record drawings.

B. Related Requirements
   1. ANSI/TIA Telecommunications Commercial Building Wiring Standards, current editions.
   2. ANSI/NFPA-70, National Electric Code. (check with the AHJ for the edition being used.)
   3. BICSI, Telecommunications Distribution Methods Manual, current edition.
   4. BICSI, Information Transport Systems Installation Methods Manual, current edition.
   5. BICSI, Customer-Owned Outside Plant Design Reference Manual, current edition.

1.03 DEFINITIONS

A. A&E: Architectural and engineering team to include all design consultants.

B. 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.

C. AHJ: Authority Having Jurisdiction

D. ARC: Aluminum rigid conduit.

E. AWG – American Wire Gauge – The standardized system for gauging the diameter of round, solid, non–ferrous, electrically–conducting wire.

F. AWS: Advanced Wireless Service

G. BICSI: Building Industry Consulting Service International.

H. BOM: Bill of Materials

I. Bonding: The permanent joining of the metallic conducting parts of equipment and conductor enclosures to assure and electrically conductive path between them that will ensure electrical continuity and have sufficient capacity to safely conduct any foreign current likely to be imposed to ground.

J. Bonding Conductor: A conductor used to interconnect the telecommunications bonding infrastructure to the service equipment (power) ground of the building.

K. EF – Entrance Facility – An entrance to a building for both public and private network service cables, including wireless, that includes the entrance point of the building and continues to the entrance room or space.

L. GRC: Galvanized rigid conduit.

M. Grounding: A conducting connection, whether intentional or unintentional, between electrical circuits or equipment and the earth, or other conducting body that serves in place of the earth

N. IDF: Intermediate Distribution Facility

O. IMC: Intermediate metal conduit.

P. MDF: Main Distribution Facility

Q. NFPA: National Fire Protection Association

R. PBB: Primary Bonding Busbar - A busbar placed in a convenient and accessible location and bonded, by means of the Telecommunications Bonding Conductor (TBC), to the building's service equipment (power) ground. Formerly known as the Telecommunications Main Grounding Busbar (TMGB).

S. RCDD: Registered Communications Distribution Designer.

T. SBB: Secondary Bonding Busbar - A common point of connection for telecommunications system and equipment bonding to ground, located in the distributor room. Formerly known as the Telecommunications Grounding Busbar (TGB).

U. Service Provider: The operator of a service that provides telecommunications transmission delivered over access provider facilities.

V. TBB – Telecommunications Bonding Backbone – The conductor that interconnects the Primary Bonding Busbar (PBB) to the Secondary Bonding Busbar (SBB).

W. TBC: Telecommunication Bonding Conductor. TBC – Telecommunications Bonding Conductor – A conductor that interconnects the telecommunications bonding infrastructure to the building's service equipment (power) ground. Formerly known as the bonding conductor for telecommunications.

X. TEBC – Telecommunications Equipment Bonding Conductor – A conductor that connects the Primary Bonding Busbar (PBB) or Secondary Bonding Busbar (SBB) to equipment racks or cabinets.

Y. TR: Telecommunications Room – An enclosed space for housing telecommunications equipment, cable terminations, and cross–connect cabling. It is the recognized location of the cross–connect between the backbone and horizontal facilities.

Z. WAP: Wireless Access Point.

AA. WSP: Wireless Service Provider

1.04 PERFORMANCE REQUIREMENTS

A. Contractor is invited to submit bids for the structured cable solution if Contractor meets the certification and other requirements detailed below.

B. The Contractor will be required to provide the following documents with the bid response:
   1. Proof of certification from the Manufacturer. Contractors on probation with this program may not be selected. Certification must be current and display the certification eligibility by date.
   2. Contractor will provide a list of all current installations that will be ongoing during the length of this project, and the work force requirements for each of those installations.
   3. Contractor must submit a minimum of three (3) references of projects of similar scope and size with details of installation including number of drops, MDF/IDF(s), the total cost of project, and the scope of services provided. Provide the names and telephone numbers of the principal contacts at the customer facility for the referenced projects. References must be for projects that are similar in scope, size, and design and must

have been the most recently completed projects of that scope. Document shall be submitted within 15 days after Contractor selection.

4. Contractor shall provide detailed listing of all projects in the last three (3) years. Document shall include, but not be limited to, project location, contact information, project size, and approximate budget of installed system. Document shall be submitted within 15 days after Contractor selection.
5. Contractor shall provide a complete list of installations that will be ongoing during the length of the Prosper project and the work force requirements for each of the listed projects.
6. Contractor must be able to provide a system certification covering link/channel specifications from the manufacturing company for a minimum period of twenty (20) years for the products they are installing.
7. Contractor shall provide a sample of the warranty that is applicable to the project when complete and documentation of the support procedure for warranty issues.
8. Contractor will submit a resume of qualification with the Contractor's proposal indicating the following:
    a. A technical resume of experience for the Contractor's Project Manager and on-site installation supervisor (project supervisor) who will be assigned to this project. Project Manager should have a minimum of 5 years' experience on projects of similar size and design. Project Foreman will have a minimum of 3 years project experience working crews of four or more personnel.
    b. A list of technical product training attended by the Contractor's personnel that will install the system.

C. Contractor will staff the project with Contractor employees only. Every Contractor employee deployed on the project shall have complete and proper training and certification by the manufacturer(s) of the products being installed.

1.05 CONTRACTOR QUALIFICATIONS

A. The nature of the structured cabling system being warrantied by the manufacturer, and the manufacturer's requirements for that warranty delivery being the use of certified installers precludes the use of subcontractors to the communications cabling. Subcontractors for this system are not permitted.

B. The Contractor selected to provide the installation of this system shall be certified by the manufacturing company in all aspects of design, installation, and able to provide warranty service of the products described herein.

C. The Contractor shall utilize the authorized manufacturer components in provisioning this Project.

D. Contractor shall have a minimum of five (5) years of recent experience on structured cabling systems of similar type and size.

E. Contractor shall comply with all federal, state and local statutes regarding qualifications of firms.

F. The Contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size.

G. The Contractor shall own and maintain tools and equipment necessary for successful installation of optical and Category 6/6A metallic structured cabling systems.

H. The Contractor shall have personnel who are adequately trained in the usage of such tools and equipment.

I. Owner reserves the right to reject bid of any bidder who has previously failed to perform properly, or complete on time, contracts of a similar nature.

J. Contractor must have personnel certified by BICSI on staff for the implementation and installation of this project.

K. Preparation of shop drawings shall be under direct supervision of an RCDD.

L. Installation shall be under direct supervision of a Technician, who shall be always present when work of this section is performed at project site.

1.06 QUALITY ASSURANCE

A. Contractor shall have a documented quality assurance program. This program shall have internal inspection team(s) to measure the service and product quality produced by the Contractor's technicians against internal and Industry standards.

B. Contractor field inspectors shall be currently registered by BICSI as an RCDD to perform the on-site inspection.

1.07 SUBMITTALS

A. Action Submittals
   1. Successful Contractor shall submit an electronic PDF copy of the submittal package within 15 days of written notification to proceed or other written documentation from the Architect or General Contractor. Binders shall be organized into the following sections:
   2. Cover Sheet and Section 1 ─ Information, Pricing and Material
      a. Cover sheet containing the Company Name and/or logo, Title of submittal package, client name, and Contractor work address with a point of contact (POC) and phone number.
   3. Section 2 ─ Product Data
      a. Manufacturer's catalog information showing dimensions, colors, and configurations.
      b. Submittals shall include all items listed in PART 2 – PRODUCTS of this document and the manufacturers cut sheets for the following:
         1) Manufacturers cut sheets for all products.
         2) In cases of multiple product numbers on a single cut sheet, the Contractor shall identify the proper part number with a cloud or highlight.

B. Informational Submittals
   1. Successful Contractor shall submit an electronic PDF copy of the submittal package within 15 days of written notification to proceed or other written documentation from the Architect or General Contractor. Binders shall be organized into the following sections:
   2. Cover Sheet and Section 1 ─ Information, Pricing and Material
      a. Cover sheet containing the Company Name and/or logo, Title of submittal package, client name, and Contractor work address with a point of contact (POC) and phone number.
   3. Section 2 ─ Pre-Qualification Certificates
      a. Contractor shall submit the following documents with project proposal:
         1) A letter of approval from the manufacturer indicating completion of pre-qualification requirements.
         2) Training certificates for design, engineering and installation of the proposed products.
   4. Section 4 ─ Warranty Documentation
      a. Warranty shall be for life of the installed product.
      b. Complete documentation regarding the manufacturer's warranty shall be submitted as part of the proposal. This shall include, but is not limited to a sample of the warranty that would be provided to the customer when the

installation is complete and documentation of the support procedure for warranty issues.

5. All submittals shall be delivered to the Architect without incomplete documentation. Submittals missing cut sheets, drawings, certification documents or are not properly filled out per this section shall be summarily rejected in whole. Supplying partial submittal packages for the purposes of ordering materials is not an approved practice and shall be rejected in whole.
6. The low voltage pre-construction meetings for all Division 11 (AV), 27 and 28 integrators shall be delayed until all sub-Contractors have received approved submittal packages from the Consultant.

C. Closeout Submittals
1. The Contractor shall provide all test and record drawings at the time of patch cable delivery. This requirement shall be met prior to the start of any final acceptance process. Delays in completing this documentation shall result in a delay in the final acceptance process.
2. Contractor shall be furnished with either a set of CAD files or the Revit model to use for record drawings.
3. Upon completion of final engineering and incorporation of the A&E review comments, Contractor shall provide to the Architect for its records the master floor plans detailing the following:
    a. Cable routing for all horizontal and backbone pathways.
        1) Pathways shall be shown in separate colors - Do not use yellow in the drawings.
        2) Provide a key legend distinguishing the colors with the specific route.
        3) Pathways shall show the cable plant from the work area outlet to the nearest MDF/IDF and the fiber and copper backbone (if applicable) pathways from each IDF to the MDF.
        4) Pathways shall include all work area locations including wireless access points, surveillance cameras or other drop locations.
    b. Rack elevations
        1) Rack elevations shall show all components as installed under this contract.
        2) Contractor shall label each component describing the particular component. (Examples: Fiber termination shelf, copper backbone patch panel, station cabling patch panel etc.).
    c. Detailed layout of the wall elevations interior to all technology spaces (if applicable systems are present).
    d. Show all drop locations with their approved labeling at the actual locations they were installed. Drawing labels shall match the label used on the faceplate at each work area outlet.
4. Drawings shall contain the Contractors own title block on the edge of the drawing and shall include the company name, address, phone number and date of the final drawings.
    a. Use any part of the Consultant / Architect title block, copyright data or seals will not be accepted.
5. Drawing documentation shall be in the following format:
    a. One (1) electronic copy transmitted to the general Contractor through their approved transmittal process.
    b. Drawings shall be E1 sized and in PDF format.
6. Drawings shall be provided to the A&E a minimum of two weeks prior to the installation of the Owner’s active network equipment. Coordinate with the Owner, A&E during the pre-construction meeting for low voltage contractors to schedule this delivery.

7. The drawings shall be reviewed on site with the A&E and the Owner prior to the final acceptance process. Drawings rejected for any reason shall delay the final acceptance process until resolved.

D. Testing Results
1. In addition to the project record drawings, the Contractor shall provide the testing information for all horizontal station cabling and all fiber backbone cabling.
2. Test results shall be provided to the A&E a minimum of two weeks prior to the installation of the Owner's active network equipment. Coordinate with the Owner, A&E during the pre-construction meeting for low voltage contractors to schedule this delivery.
3. The test results shall be reviewed with the close out drawings prior to the final acceptance process. Test results rejected for any reason will delay the final acceptance process until resolved.
4. Reference section three for additional testing requirements.

E. In addition to the above copies the Contractor shall provide the cabling manufacturer the necessary copies of all test documentation as part of the warranty completion process and return a copy of the warranty document as provided by that manufacturer.

1.08 DELIVERY STORAGE AND HANDLING

A. Comply with requirements of the delivery storage and handling specification sections in the project specification book.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Stored materials shall be protected from exposure to harmful environmental conditions and at temperature conditions recommended by manufacturer.

D. Handle products and systems in accordance with manufacturer's instructions.

E. Contractors are required to remove all empty containers and other trash associated with the system. This includes all packaging, excess cable and other materials that hold no value to the Owner.

1.09 PROJECT CONDITIONS

A. Project Environmental Requirements
1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
2. Do not begin installation until instructed to perform by the Owner Construction Manager at Risk.
3. All Contractors will comply with Owner policies concerning alcohol, tobacco, and firearms as well as any other Owner policy governing dress, behavior etc while on campus or on any land owned by The Owner.

B. Damages
1. The Contractor shall be liable for all damages to portions of the building caused by it, including but not limited to the following:
   a. Damage to any portion of the building caused by the movement of tools, materials or equipment.
   b. Damage to any component of the construction of spaces "turned over" to the Contractor.
   c. Damage to the electrical distribution system and/or other space "turned over" to the Contractor.

d. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the Contractor or other actions of Contractor.

2. Other damage to the materials, tools and/or equipment of Owner, its consultants, General Contractor, subcontractors, Architect, other Contractors, agents and lessees.

C. At the completion of the System installation, the Contractor shall restore to its former condition, all aspects of the project site and on a daily basis, shall remove all waste and excess materials, rubbish debris, tools and equipment resulting from or used in the services provided under this Contract.

1. All clean up, restoration, and removal noted above shall be by the Contractor and at no cost to Owner, the Architect or General Contractor.
2. If the Contractor fails in its duties under this paragraph, Owner or the General Contractor shall upon notice to the Contractor perform the necessary clean up and deduct the costs thereof from any amounts due or to become due to the Contractor.
3. Contractor shall coordinate through the General Contractor for dumpsters and material storage locations.
4. It shall be the Contractor's responsibility to remove trash from the areas it is working in and bring trash and debris to the dumpster.
5. The Contractor shall not use the General Contractor's dumpsters or trash disposal without prior approval of the General Contractor.

1.10 COORDINATION

A. Single Point of Contact / Project Manager

1. Contractor shall provide a single point of contact, i.e., Project Manager, to speak for the Contractor and to provide the following functions:
   a. Initiate and coordinate tasks with the Owner Technology Projects Manager, its General Contractor, Architect, and others as specified by the Architect or General Contractor.
   b. Provide day-to-day direction and on-site supervision of Contractor personnel.
   c. Ensure conformance with all Contract provisions.
2. If the Project manager is unable to remain continuously on site a project, Forman shall be required to remain. The project supervisor shall be responsible for day-to-day activities and reporting all status to the Project Manager.

B. Technical Support

1. Contractor shall provide technical support consisting of two technicians for a full working day when Owner deems necessary during the physical move to the site.
2. The personnel providing technical support shall:
   a. Have intimate knowledge of the system and materials that were used.
   b. Be skilled in all use of equipment and materials used under the Contract.
   c. Be competent to troubleshoot and fix problems associated with Contractor provided materials.
   d. Have the test equipment, tools, and materials needed to troubleshoot and remediate problems associated with Contractor provided materials and installation.

1.11 WARRANTY

A. Structured Cabling System Extended Product Warranty and Application Assurance Program

1. Extended Product Warranty
   a. The Extended Product Warranty covers product defects for all Contractor provided and installed components of the premise distribution. The manufacturer will warrant, from the date the project warranty certification is issued by the manufacturer to the end-user, the following:

b. The products that comprise the registered premise distribution will be free from manufacturing defects in material or workmanship under normal and proper use.
c. Under the Product Warranty, manufacturer will either repair or replace the defective product itself at manufacturer's cost. The manufacturer will pay an Authorized Installation Company for the cost of labor to repair or replace any such defective product on behalf of the manufacturer.

B. Term of Warranty
1. Contractor will provide a 25-year product and performance warranty under the Manufacturer's warranty program.

C. Persons / Entity Covered
1. This Limited Warranty will be for the benefit of the person or entity to which the manufacturer's Registration Certificate is issued and any successor (Transferable) in interest to the site in which such System was originally installed by the manufacturer or an Authorized manufacturer's Reseller.

PART 2 - PRODUCTS

2.01 HORIZONTAL STATION CABLE

A. Acceptable Manufacturer:
1. Leviton LANmark-1000 Category 6 Riser rated.
2. PN# 10032455

B. Jacket color shall be blue.

2.02 CATEGORY 6A OUTLETS

A. Acceptable Manufacturer
1. Leviton Extreme 6+
2. PN# 61110-RL6 and 6110-RE6

B. Outlet color:
1. Blue for data, voice, printer, access control
2. Black for all patch panel ports

C. Terminate cables using 568B wiring scheme.

2.03 FACEPLATES

A. Acceptable manufacturer: Leviton QuickPort
1. Part number: 42080-2WS for 1 to 2 data
2. Part number: 42080-4WS for 3 to 4 data
3. All unused ports will be filled in with a blank module. The blank module will match the faceplate for color.

2.04 SURFACE ENCLOSURES FOR WIRELESS, SURVEILLANCE, TV, OR PROJECTOR LOCATIONS.

A. Acceptable manufacturer: Leviton
1. Part number: 41089-1WP & 41089-2WP

2.05 PATCH PANELS

A. Acceptable manufacturer: Leviton
1. Part Number: 69270-U24 and 69270-U48

B. Panels shall be installed with one panel above the owner furnished switch and one panel below the switch. A 24-port patch panel will be installed below the fiber termination enclosure near the top of the rack, followed by a 1RU space for OFOI network switch,

followed by the 48-port patch panel, then another 1RU space etc. The last panel, if necessary, will be a 24-port patch panel that will occupy the space directly below the last network switch. Do not exceed more than 8 each 48-port network switches in a single rack space.

C. Patch panel inserts shall be black.

D. Patch panels shall be fully populated with the provided inserts.

2.06 CATEGORY 6A PATCH CORDS

A. Acceptable manufacturer: Leviton
   1. Part number: 6H460-6ix

B. Colors:
   1. Data and VoIP: Blue
   2. EMCS: White
   3. Surveillance: Violet
   4. Wireless: Green

C. Lengths:
   1. Work Area Outlets: 10’
   2. Surveillance Interior:10’
   3. Surveillance Exterior Building Mounted:3’
   4. Surveillance Exterior Pole Mounted: See item 2.08.D.1.b
   5. Surveillance Exterior Canopy Mounted: built to length in field x two locations.
   6. Wireless above ceiling: 10’
   7. TV: 3’
   8. Projector: 5’
   9. MDF patch panel: 6”

D. All patch cords shall be given to the Owner’s Technology Project Manager using the General Contractor’s Equipment Transmittal Process.

2.07 OUTSIDE PLANT TEXTILE INNERDUCT

A. Acceptable Manufacturer:
   1. Maxcell – 3 Chamber, 4” or 2” Innerduct
   2. Standard Outdoor Textile Innerduct: Micro (33mm), 2-inch, 3-inch and 4-inch single or multi-cell polyester/nylon textile innerduct containing 1250lb polyester flat woven pull tape.

B. Textile Innerduct Installation
   1. Provide textile innerduct in conduit and wire ways using continuous, un-spliced, lengths of textile innerduct between maintenance holes, pull boxes, and/or termination points as indicated on the drawings.
   2. Follow manufacturer installation instructions
   3. Provide suitable textile innerduct slack in the maintenance holes, hand holes, pull boxes, and at turns to ensure there is no kinking or binding of the product.
   4. Textile Innerduct Mountings, Hangers and Attachments: When exposed indoors or in maintenance holes, hold firmly in place using independent support.
      a. Design & install hangers and other similar fittings adequate to support loads and so as to not damage innerduct.
      b. Do not fasten textile innerduct to steam, water, or other piping, ductwork, mechanical equipment, electrical equipment, electrical raceways, or wires
   5. Maintenance Hole and Hand Hole Installation:
      a. At locations where textile innerduct will be continuous through a manhole or hand hole, allow sufficient slack so that the innerduct may be secured to the side of the vault maintaining the minimum bend radius.

b. At maintenance holes serving as the junction location, pull the exposed end of the innerduct to the far end of the vault, install termination bag, and secure to the vault.

6. Penetrations
   a. Seal all conduit and textile innerduct entering structures at the first box or outlet to prevent entrance into the structure of gases, liquids or rodents.
   b. Install proper firestopping products.
   c. Exposed Textile Innerduct Penetrations: Install conduit sleeves or fire barrier sealing systems in all openings where open and exposed textile innerduct passes through fire-rated walls and floors. After installation, install intumescent fire barrier penetration sealing material (Hilti system) between textile innerduct and sleeves or fire barrier system.
   d. Raceway Penetrations: After textile innerduct installation, install intumescent fire barrier penetration sealing material (Hilti system) between textile innerduct and conduit or wire way at all exposed penetration locations.

C. Protect adjacent surfaces from damage during water seal or fire stop installation. Repair any damage.

2.08 ARMORED FIBER OPTIC BACKBONE CABLING – MDF TO IDF'S

A. Acceptable Manufacturer: Berk-Tek, 6-strand single mode, armored, plenum rated, indoor outdoor.

B. Part Number: PDPK006AB0707

C. Fiber optic cables have service loops of 10' at each end and each service loop shall be properly secured above ceiling.

2.09 FIBER OPTIC ENCLOSURES

A. Provide and install 1RU fiber optic cable enclosures in the new MDF and IDF rooms. Install the fiber enclosure in the top of rack (TOR) position.

B. Acceptable manufacturer: Leviton
   1. Part Number: OPT-X 1000i Series, 5R1UM-F03
   2. Equip all enclosures with SDX adapter plates equipped with LC duplex connections.
   3. Provide and install blank plates for all unused bulkhead openings.

C. Contractor shall provide all applicable parts for fiber termination enclosures provisioning for terminating strands. These parts may include, but are not limited to, connectors, adapter panels, bulkheads, termination kits, and consumables.

2.10 FIBER OPTIC CABLE CONNECTORS

A. Acceptable manufacturer: Leviton

B. Part number: 49991-SLC

C. Terminate all fiber strands.

2.11 FIBER OPTIC PATCH CORDS

A. Acceptable manufacturer: Leviton

B. Single mode, LC to LC configurations, 2m,

C. Two (2) each for each new IDF room

D. Two (2) each for each IDF connecting into the MDF room.

2.12 COPPER BACKBONE

A. Acceptable manufacturer: Leviton

B. Provide and install two (2) 4-pair category 6, OSP or Indoor-outdoor rated copper from the MDF to each IDF in Areas 1 and 3.

C. Provide and install one (1) each 4-pair category 6, OSP or Indoor-outdoor rated copper from the MDF to the IDF in Area 4.

D. Terminate the copper backbones on wall mounted 66-blocks located in the comm rooms. Provide bridge clips for each pair and provide a hinged cover. Cover does not need to be Orange. Wall blocks shall match category rating of cable used.

2.13 EQUIPMENT RACKS

A. Acceptable manufacturer: Hoffman
   1. Part Number: EDR19FM45UCM2

2.14 VERTICAL WIRE MANAGEMENT

A. Acceptable manufacturer: Hoffman
   1. Part number: 6” PN#: DV6D7
   2. Part Number 10” PN#: DV10D7

B. Install 10” between racks when more than one rack is shown in the room on the drawings.

C. Install 6” on the end of each rack.

2.15 PLYWOOD

A. Provide and install 3/4” A/C grade fire-resistant plywood backboard in Communication spaces (IDF) as noted on drawings.

2.16 12” LADDER RACK

A. Acceptable Manufacturer: Chatsworth (CPI)
   1. Part number: 10250-712
   2. The Triangular Support Bracket shall be 18” wide.
      a. Part Number: 11312-718
   3. 6” cable runway elevation kit:
      a. Part number: 10506-716

B. Contractor will ground all ladder rack..

C. The contractor shall size vertical ladder rack at all conduit sleeve locations to support fiber and copper backbone pathways from the point of entry on the floor to the transition to the overhead ladder rack. The contractor shall include stand-off brackets and protective boots for all vertical ladder rack assemblies.

D. Contractor will install protective boots at each end of the rack assembly.

E. Contractor will be responsible for providing the required amount of support equipment including but not limited to wall angle brackets, triangle support brackets, butt splice kits, junction splice kits, cable runway E-bends, rack to runway mounting plates etc.

2.17 THREADED ROD PROTECTOR

A. If Contractor uses threaded rod for pathway supports, or if a bundle is near, or will touch any other craft’s threaded rod, a protector shall be installed by the Contractor.

B. Chatsworth 11085-001

2.18 NON-CONTINUOUS CABLE SUPPORTS

A. Requirements
   1. Non-continuous cable supports shall be Erico Caddy J-Hooks or approved substitute.

B. Description

1. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed.
2. Bundles shall be a maximum 24 cables. Multiple bundles shall not share a J-Hook.
3. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
4. Non-continuous cable supports sized 1 5/16” and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.
5. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.
6. Stainless Steel non-continuous cable supports are intended for indoor and outdoor use in non-corrosive environments or where only mildly corrosive conditions apply.
7. If required, assemble to manufacturer recommended specialty fasteners including beam clips, flange clips, C and Z purlin clips.
8. Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies may be factory assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports, rated for indoor use in non-corrosive environments; cULus Listed.
9. If required, the multi-tier support bracket may be assembled to manufacturer recommended specialty fasteners including beam clamps, flange clips, C and Z purlin clips.
10. No support may be secured to the drop ceiling grid support wire. Contractors installing their support devices to the grid wire will replace the assembly at no cost to the client, the Architect or the General Contractor.
11. If Contractor installs drop wire for pathway support devices, installation must comply with all NEC requirements including attaching both ends of drop wire as well as color-coded securing clips. Contractor is responsible for all damage and/or interference of other building systems using this method and will remediate at Contractor’s sole expense.

2.19 GROUNDING BUSBAR

A. Acceptable Manufacturer: Chatsworth
   1. Part number: 13622-012

2.20 GROUNDING WIRE

A. Acceptable Manufacturer: Chatsworth
   1. Part number: 40159-001

B. Contractor will provide a #6 AWG stranded copper wire cable insulated with a green jacket between the ground bar located in the room to the equipment, ladder rack, equipment rack, and other required grounding points using proper end attachment hardware in those spaces. This does not include the installation of a grounding backbone between the MDF and each IDF.

2.21 COMPRESSION LUGS

A. Acceptable manufacturer: Chatsworth
   1. Part Number: 40162-90#
      a. All lugs shall be two hole long barrel compression and sized for the #6 cable size.
      b. All lugs shall be secured with minimum 2 crimps.
      c. Set hole spacing on lug to match ground bar.

2.22 CABLE RUNWAY BONDING STRAPS

A. Acceptable manufacturer: Chatsworth

1. Part number: 40164-001
2. Or Owner approved equal.

2.23 TELECOMMUNICATIONS BONDING BACKBONE

A. The electrical contractor shall provide the Telecommunications Bonding Backbone between the PBB and building ground.
   1. Contractor will size the grounding backbone as per the NEC and the measured distance from the ground bar to the building ground and to the panel ground.
   2. Telecommunications Bonding Backbone shall be in compliance with NEC Article 250 and TIA-607-D.

2.24 INSTALLATION OF OWNER FURNISHED HANDSETS & CONTRACTOR PROVIDED MOUNTS

A. Contractor shall install owner furnished handsets into each office area and classroom.
   1. This scope will include one handset per classroom or specialty classroom, one handset per office, two handsets in the reception area, one handset in the gym and library offices, one handset for the workroom.
   2. Additional wall phone locations may be identified on the drawings.
   3. Provide and install contractor furnished mounts with the phones.
      a. Cisco PN: CP-7800-WMK

2.25 CARINA SURFACE MOUNT INDOOR INTERCOM

A. Provide and install door intercom button with data connection in Life Skills Classroom

B. Manufacturer: Wahsega
   1. Part number: WL-IC-FLMT-SIP-I-W-R-CAR

C. Owner shall program the device once connected to the network.

2.26 INSTALLATION OF ELEVATOR TEMPORARY DIAL SOLUTION

A. Contractor shall obtain and install the temporary dial solution for the elevator emergency communication system. This must be accomplished prior to the certification of occupancy can be completed.

B. Acceptable manufacturer: Kings III Emergency Communications
   1. First POC: Beth Stiers - Government Business Development Manager:
   2. Phone: 972-350-0027
   3. Email: estiers@kingsiii.com

C. Secondary POC: Mart Riley - Vice President Strategic Sales
   1. Phone: 972-350-0027
   2. Email: mriley@kingsiii.com

D. Third POC: Kings III Emergency Communications Main Number
   1. Phone: 972-350-0027

E. Contractor shall give Kings III a minimum of two weeks (10 business days) notice prior to delivery date to avoid shipping costs.

F. Connection to the elevator control panel by elevator contractor.

G. Notify the General Contractor once the solution has been installed so they can notify the Owner.

2.27 WALL MOUNTED WIRELESS ACCESS POINT BRACKETS

A. Contractor shall obtain and install mounts for wall mounted wireless access points.

B. Wall mount brackets for gyms / shelter and Hub
   1. Acceptable manufacturer: Oberon
   2. Part Number: 1007-COAP9136

3. 2 each Gym / Shelter.
4. 1 each outdoor learning patio adjacent to the Hub.
5. 1 each on second floor outdoor classroom.

2.28 UNSPECIFIED EQUIPMENT AND MATERIAL

A. Any item of equipment or material not specifically addressed on the drawings or in this document and required to provide a complete and functional installation will be provided and installed.

PART 3 - EXECUTION

3.01 ENTRANCE FACILITIES

A. Contractor shall be responsible for any damages to active network electronics or any existing cable plant connection. Contractor shall report any damage to the General Contractor immediately.

3.02 TECHNOLOGY PATHWAYS AND SPACES

A. Components of the system shall be installed in a neat, professional manner.

B. Wiring color codes shall be strictly observed and terminations shall be uniform throughout the system.

C. Identification markings and systems shall be uniform.

D. Comply with TIA 568.2-D wiring codes for cabling.

E. Cable pathway
   1. All cable pathways visible in exposed ceiling and exposed areas of cloud ceiling environments, shall be concealed within conduit.
      a. Conduit and bushings shall be by DIV 26.
   2. Cable pathways above accessible ceiling shall be Mesh Cable Basket, Ladder tray or J-Hooks. Basket, ladder and J-Hooks shall be by DIV 27 Contractor.
   3. Conduits shall be free of debris prior to placing cable.
      a. Cable that is placed in conduits with debris shall be replaced at Contractor's sole expense.
   4. Change of direction of cables from a cable bundle shall not be accomplished by the use of a hook and loop (Velcro©) strap.
   5. Cable bundles shall exit cable tray vertically with the use of "waterfalls" or "cable drop" assembly at all times. Cable turning vertically over right angles or wire basket shall be deemed to be in violation of bend radius requirements.
   6. Cable bundles shall be supported via J-Hooks attached to the existing building structure and framework at a maximum of four (4) foot intervals.
   7. Cables shall not be supported, rest on, or touch any part of the building except for approved structured cabling support/suspension devices.
   8. Pathways shall not be attached to lift out ceiling grid supports or laid directly on the ceiling grid or tiles.
   9. Pathways shall not be attached to or supported by fire sprinkler heads or delivery systems, or any environmental sensor located in the ceiling air space including duct work.
   10. Fasten cables on vertical runs to cable trays every 18 inches.
   11. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 60 inches.

F. Sleeves

1. Cable pathway sleeves shall consist of properly sized sleeves, equipped with bushings on both sides for all fire wall penetrations.
2. Use of sleeves pre-loaded with fire stop, such as the STI EZ Path, Flamestopper through wall fittings is approved for use in all firewall locations. These devices do not need to be used in areas where firewalls are not being used. This includes all sleeves over hard ceilings, exposed ceilings etc. Product shall be installed prior to cable installation for protection of cables.
    a. Cables installed prior to firestop system shall be removed and reinstalled at Contractor's sole expense.
3. Firestop all Premise Distribution sleeves to meet wall rating for flame and water stream tests.
4. Re-seal all conduits entering MDF or IDF room that had their fire stop removed as part of this scope.
5. Contractor shall determine fire wall locations using the Architectural Drawings and provide the appropriate quantity of sleeves as needed.

G. Horizontal Cabling
1. Contractor shall provide horizontal cables to connect each information outlet to the backbone subsystem on the same floor.
2. Each run of cable between the termination block and the information outlet shall be continuous without any joints or splices.
3. The 4-pair UTP cables shall be run using a star topology format from the administration subsystem (MDF/IDF) to every individual Telecommunication Outlet.
4. The length of each individual run of horizontal cable from the administration subsystem (MDF or IDF) on each floor to the Telecommunication Outlet shall not exceed 295 ft (90 m).
5. The Contractor shall adhere to the manufacturers' requirements for pulling tension of all cables.
6. Plastic tie wraps are not permitted in the pathway for structured cable. All cables bundled by plastic tie wraps during any phase of the installation shall be replaced at Contractor's expense.
7. Contractor shall coordinate with electrical contractor for final pathway support to include but not limited to, sleeves, conduits through exposed ceiling spaces etc.
8. Cables shall not be attached to lift out ceiling grid supports or laid directly on the ceiling grid or tiles.
9. Cables shall not be attached to or supported by fire sprinkler heads or delivery systems or any environmental sensor located in the ceiling air space including duct work.
10. During initial cable installation, or "rough-in," cable shall be protected.
    a. Cable shall not be left exposed on the floor.
    b. Cable shall be protected with open-top boxes, properly used slings, and approved barricades.
    c. Cable shall not be suspended by tie wraps or any other means which cause cable deformation.
    d. Use wide-based support systems appropriate to bundle size to support cable during rough-in phase.
    e. Contractor is required to coordinate placement of cables in locations and at construction phases to avoid paint on the cables. Coordination shall be with the General Contractor. Painting cabling is considered a field modification by the manufacturer and alters the fire rating of the cable jacket. Cables coated with paint shall be replaced at Contractor's sole expense if coordination has not occurred.
11. Contractor shall not install cable in any conduit prior to the installation of conduit bushings.

a. Contractor shall coordinate the acquisition and installation of conduit bushings with electrical Contractor.
b. Any anticipated delay of cable installation because of conduit or conduit bushing installation shall immediately be brought to the attention of the General Contractor.

12. Contractor shall observe the recommended bending radius and pulling strength requirements of the 4-pair UTP cable during handling and installation.
    a. Bends which deform the cable jacket shall be avoided. Violation of bend radius shall be remedied with the replacement of the cable at the Contractor's sole expense.
    b. Cables pathways leaving J-Hooks to conduit stub outs shall be a gradual sweep.
13. In suspended ceiling and raised floor areas where duct, cable trays or conduit are not available, the Contractor shall bundle, in bundles of 24 or less, station wiring with hook and loop (Velcro) straps snug, but not deforming the cable geometry.
14. Cable bundles shall be supported via J-Hooks and/or saddles/slings attached to the building structure and framework at a maximum of five (5) foot intervals.
15. The Contractor shall not install any cable pathways above an electrical room.
16. Pathways shall not be parallel to electrical pathways without proper separation.
    a. Station cables and tie cables pathways shall be routed at right angles to electrical power circuits.
17. In suspended ceiling and raised floor areas where walker duct, cable trays or conduit are not available, the Contractor shall bundle station wiring with hook-and-loop (Velcro) cable straps at appropriate distances.
    a. The cable bundling shall be supported via J-Hooks attached to the existing building structure and framework.
    b. Each J-Hook shall contain only one type of transmission media.
18. Cables shall not be supported by mechanical ductwork or any of its support structure.
19. Cables shall not wrap around, or in general, touch building structural systems.
20. Conduit pathways installed by the Contractor should not exceed 100 feet or contain more than two 90-degree bends without utilizing appropriately sized pull boxes.
21. All outlets shall be protected from construction related dust by using dust-proof barriers. Outlets not protected shall be replaced at Contractor's expense.
22. Any cabling found contaminated with paint, or other agents shall be replaced at the contractor's cost.
23. 36" sservice loops shall be installed at the work area outlet above the conduit stub-up in a J-Hook and configured in an industry standards compliant arrangement at all locations except AP locations.
    a. Provide 12" service loop at AP locations.
24. No support may be secured to the drop ceiling grid support wire. Contractors installing their support devices to the grid wire will replace the assembly at no cost to the client, the Architect or the General Contractor.
25. Contractors that violate these standards will be required to remove the cable at fault, correct the pathway and re-install the cabling at Contractor's sole expense.

H. Backbone Cabling
1. All cable shall be continuous and non-spliced from termination point to termination point.
2. Cable shall not exceed allowable bend radius according to manufacturer, BISCI and TIA-569-E standards.
3. Fiber optic cable shall have service loops of 10' at each end and each service loop shall be properly secured above ceiling.

4. Copper and fiber backbone shall be supported in dedicated J-Hooks. Backbone cabling may be supported in the same cable tray with the horizontal providing proper separation and pathway management are used.

I. Surface enclosure installation:
   1. Install surface enclosures in ceiling spaces for all ceiling mounted devices or wall mounted device locations calling for ceiling-based outlets as shown on the drawings.
   2. Coil the maintenance loop and insert it directly over the device location. Support with dedicated J-Hook installed on wall surface or suspended by dedicated grid wire or all thread supported by structure. Devices should be installed within twelve inches of the ceiling tile. Ref drawings for elevations and device locations.
   3. Install classroom AP's in the center of the classroom. Install TV cabling directly over the display location Terminate projector outlets over the projector location.

J. Patch panels:
   1. Contractor will calculate the number of ports based on the number of LAN outlets served by the MDF. All voice and data station cables will terminate on the same patch panel. Patch panel density must provide for an additional 10% growth capability.
   2. Contractor shall terminate standard data on ports 1-36 of the 48-port modular patch panel. Terminate wireless cabling on ports 37-48.
   3. Surveillance cameras shall be installed on the last patch panel as determined by total drop count starting from port 48 and working back to port 1.

K. Textile Innerduct Installation
   1. Provide textile innerduct in conduit and wire ways using continuous, un-spliced, lengths of textile innerduct between maintenance holes, pull boxes, and/or termination points as indicated on the drawings.
   2. Follow manufacturer installation instructions.
   3. Provide suitable textile innerduct slack in the maintenance holes, hand holes, pull boxes, and at turns to ensure there is no kinking or binding of the product.
   4. Textile Innerduct Mountings, Hangers and Attachments: When exposed indoors or in maintenance holes, hold firmly in place using independent support.
      a. Design & install hangers and other similar fittings adequate to support loads and so as to not damage innerduct.
      b. Do not fasten textile innerduct to steam, water, or other piping, ductwork, mechanical equipment, electrical equipment, electrical raceways, or wires
   5. Maintenance Hole and Hand Hole Installation:
      a. At locations where textile innerduct will be continuous through a manhole or hand hole, allow sufficient slack so that the innerduct may be secured to the side of the vault maintaining the minimum bend radius.
      b. At maintenance holes serving as the junction location, pull the exposed end of the innerduct to the far end of the vault, install termination bag, and secure to the vault.
   6. Penetrations
      a. Seal all conduit and textile innerduct entering structures at the first box or outlet to prevent entrance into the structure of gases, liquids or rodents.
      b. Install proper firestopping products.
      c. Exposed Textile Innerduct Penetrations: Install conduit sleeves or fire barrier sealing systems in all openings where open and exposed textile innerduct passes through fire-rated walls and floors. After installation, install intumescent fire barrier penetration sealing material (Hilti system) between textile innerduct and sleeves or fire barrier system.
      d. Raceway Penetrations: After textile innerduct installation, install intumescent fire barrier penetration sealing material (Hilti system) between textile innerduct and conduit or wire way at all exposed penetration locations.

7. Protect adjacent surfaces from damage during water seal or fire stop installation. Repair any damage.

L. Cable tray pathway protection.
1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable trays can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.
4. Coordinate with the contractor to avoid unnecessary exposure to painting, installation of blown fire stopping materials or other agents. Cover and protect all cabling until installation of agents has been completed. Remove agents from tray following manufacturer's guidelines.

M. Cable tray installation
1. Install cable trays according to NEMA VE 2.
2. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.
3. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.
4. All cuts shall be in accordance with the manufacturer’s instructions using flush cut tools.
5. Remove burrs and sharp edges from cable trays.
6. Fasten cable tray support to building structure per manufacturer installation requirements.
7. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
8. Cable basket shall be supported via trapeze structure consisting of two (2) 3/8" threaded rods affixed to structure. Cross member shall consist of 1-5/8" minimal universal strut, secured to threaded rod via hex nut and flat washer.
9. Cable basket trapeze shall be installed at distances no greater than 5’, achieving two trapeze supports per 10’ section of basket. Sections less than 10’ shall have a minimum of one (1) trapeze support.
10. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.
11. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA VE 2. Space connectors and set gaps according to applicable standard.
12. Make changes in direction and elevation using manufacturer's recommended fittings.
13. Make cable tray connections using manufacturer's recommended fittings.
14. Seal penetrations through fire and smoke barriers with UL rated, fire stopping materials and systems.
15. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.
16. Install cable trays with enough workspace to permit access for installing cables.

N. Penetrations of walls, floors and ceilings:
1. Prior consent

a. The Contractor shall make no penetration of floors, fire-rated walls or ceiling without the prior consent of the General Contractor.

2. The use of PVC sleeves in any interior pathway location is not acceptable.
3. Sealing penetrations
   a. Where penetrations through acoustical walls or other walls for cableways have been provided for the Contractor or made by the Contractor, such penetrations shall be sealed by the Contractor in compliance with applicable code requirements and as directed by the General Contractor.
   b. Where penetrations through fire-rated walls for cableways have been provided for the Contractor or made by the Contractor, the Contractor shall seal such penetrations as required by code and as directed by the General Contractor.

3.03 BACKBOARDS

A. Plywood shall be painted white with fire retardant paint on all sides.

B. Plywood shall meet all applicable codes.

C. Do not paint over the manufacturer's fire rating stamp.

3.04 RACKS AND WIRE MANAGERS

A. Contractor will provide and install per T Series drawings.
   1. Racks will be mounted on an isolation pad and utilize non-conductive washers to secure the rack to the floor.
   2. Floor mounted open racks will be secured from the top rail to the backboard in the room with a length of cable runway to prevent movement.
   3. All racks will be grounded to the isolated ground bar within the MDF using specified cable and hardware.

B. Contractor will provide and install Vertical Wire Manager in location and quantity per T Series drawings.

3.05 BONDING AND GROUNDING

A. Communication bonding and grounding will be in accordance with the NEC®, NFPA, and TIA-607-D.

B. Horizontal cables and equipment will be grounded in compliance with ANSI/NFPA 70 and local requirements and practices.

C. Outside plant cable, conduit, and terminals shall be grounded per manufacturer's instructions at all ends.

D. Cable tray grounding
   1. Ground basket in accordance with NFPA 70, TIA 607-D and Manufactures requirements.
   2. Painted and coated surfaces shall be neatly prepared for grounding lugs. Excessive removal of painting and/or coating shall be corrected with new product at Contractor's sole expense.
   3. Contractor shall follow manufacturer's technical instructions for quantity of grounding connections and installation to ensure assembly maintains manufacturers UL listed assembly.

E. Grounding lugs:
   1. Both holes in the lugs shall be secured with hex head bolts, flat washers and hex nut hardware.
   2. Lugs shall be long barrel and secured by a minimum of 2 crimps.
   3. Attaching hardware shall be firmly secured.
   4. Grounding lugs shall have a metal to metal attaching connection.

5. Painted and coated surfaces shall be neatly prepared for grounding lugs. Excessive removal of painting and/or coating shall be corrected with new product at Contractor's sole expense.
6. Contractor shall follow manufacturer's technical instructions for installation.

F. Telecommunications Secondary Bonding Busbar (SBB)
1. The Contractor shall furnish and install a SBB in each new IDF and shelter control room.
2. Contractor shall ensure the SBBs are installed using only manufacturer-approved installation methods and materials.

G. Intra-room grounding conductors:
1. Contractor shall provide a #6 AWG stranded copper wire cable insulated with a green jacket between the ground bar located in the room to the equipment, ladder rack, equipment rack, and other required grounding points using proper end attachment hardware.
   a. This does not include the installation of a grounding backbone between the MDF and each IDF. See item D for information pertaining to grounding backbones outside the confines of the telecommunications space.
2. The Contractor shall attach grounding cable to appropriate end connecting hardware using manufacturer-approved materials and methods.

3.06 IDENTIFICATION AND LABELING

A. Labeling ─ Work Area Locations
1. Contractor shall contact Owner's Technology Projects Manager to verify below labeling standards.
2. The Contractor shall be responsible for printed labels for all cables and cords, distribution frames, and outlet locations, according to Owner approved specifications at the time of delivery.
3. Ceiling grid labels shall match the work area location above ceiling.
   a. The Contractor shall label, according to Owner cabling standards, all cable runs at the MDF/IDF and Horizontal Cable locations.
   b. Do not place labels on the ceiling grid directly adjacent to a light.
   c. Labeling above ceiling location shall consist of black text on white tape using 3/8" tape with 30 pt. font.
   d. Owner labeling standard requires the following information to be visible at each work area outlet:
      1) MDF or IDF, Patch Panel Number (starting with "1") and port number per patch panel (starting with "1")
      2) Examples:
         i) MDF 1-36 (denotes port 36 of Patch Panel 1 in the MDF)
         ii) IDF1 2-36 (denotes port 36 of Patch Panel 2 in the IDF)
      3) All locations shall use the above system unless otherwise directed by the Owner Technology Department. No unique identifiers for any location including, but not limited to, cameras and wireless access points.
   e. Cable identifiers shall be sequential on the MDF/IDF patch panels.
   f. The Contractor shall label both ends of each cable within two (2) inches of the termination. This is behind the faceplate and the patch panel with permanent machine-generated labels.
   g. Labels shall be machined printed Brady (or equivalent).
   h. Labels shall not be written by hand.

B. Labeling ─ Face Plates
1. Label all drops on the faceplate top front as per Owner Horizontal WAO Standards.

2. Affix a machine printed Brady (or equivalent) label over the handwritten Sharpie identification.
3. Labels shall not be written by hand.

C. Labeling – Patch Panels
1. Label all patch panel ports as per Owner Labeling standards.
2. Patch panel port labeling shall be machined generated (Brady or equivalent).
3. Labels shall not be written by hand.
4. Owner labeling standard requires the following information to be visible at each patch panel port from cabling to locations noted below:
   a. Classrooms, Offices, Storage Rooms, etc.:
      1) Locations in rooms shall be numbered 1 through 10. Numbering shall be in a clockwise direction starting with the location closest to the door and continue around the room in same clockwise direction.
      2) The last number in the room shall be the permanent link installed at the display TV2 or projector VP2 location.
      3) Room Example: Rm #, Rm port #, IDF/MDF-Patch Panel-patch panel port#. A teacher port would look like this: 409-3 IDF2-1-10
      4) Wireless access points in rooms: 409-6, AP-IDF2-1-19
      5) External cameras with data in a room: 409-7, CAM#-IDF2-3-20
   b. Hallways:
      1) All locations shall be identified by the hall number which shall be designated by the Owner Technology Department.
      2) Numbering system for hallways shall start at the end closest to the main entrance or hallway.
   c. Exterior
      1) Numbering system for exterior locations shall be ordered sequentially in order: North side, East side, South side and West side.
   d. All locations shall use the above system unless otherwise directed by the Owner Technology Projects Manager. No unique identifiers for any location including, but not limited to, cameras and wireless access points.
   e. OSP Conduit sleeve penetrations in MDF and IDF Room
      1) Label each backbone fiber and or copper 12” above the point where the cable enters the underground conduit from inside each comm room. Backbone shall be labeled with the destination of the fiber / copper. IDF-1-12-Strand OM4 50/125, IDF-2 4 Pair UTP etc.
      2) Label unused conduit sleeves with their destination from each comm room. “IDF-2 Spare” as needed.
5. Cable identifiers shall be sequential on the MDF/IDF patch panels.

D. Labeling – Ceiling tiles
1.

E.

3.07 TESTING

A. Copper link testing:
1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a level IIIe or level IV test unit for Category 6A performance compliance.
2. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity, and pair-reversals, crossed pairs, and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated

by the test unit in accordance with the manufacturers' recommended procedures and referenced to the appropriate cable identification number and circuit or pair number.

a. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
b. All NVP settings must match the manufacturer cabling installed used for the project. Failure to properly match this setting shall result in all tests being rejected.
c. Passing test results for every copper cable/conductor and every fiber strand which was furnished as part of the product. Tested items marked with an (*) shall not be acceptable.

3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate.
   a. The cable length shall not exceed the maximum distances set forth in the ANSI/TIA/EIA-568-C.0 & ANSI/TIA/EIA-568-C2 Standards.
   b. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.
4. Category 6/6A Performance:
   a. Follow the Standards requirements established in ANSI/TIA/EIA-568-C.2 A level III test unit is required to verify category 6/6A performances including:
      1) Wire map
      2) Resistance
      3) Characteristic impedance
      4) Length
      5) Propagation delay
      6) Delay skew
      7) Insertion loss (attenuation)
      8) NEXT (near-end crosstalk) and NEXT at the smart remote
      9) PSNEXT (Power sum near-end crosstalk loss)
      10) Return loss
      11) ACR-N (attenuation to crosstalk ratio at the near end) and ACR-N at the smart remote
      12) PS ACR-N (power-sum attenuation to crosstalk ratio) and PS ACR-N at the smart remote
      13) ACR-F (equal level far-end crosstalk)
      14) PS ACR-F (power-sum equal level far-end crosstalk)

B. Acceptable testing manufacturers:
   1. Trend Lan-Tek
   2. Fluke Networks
   3. Owner approved equal.

C. All testing equipment utilized for all cable testing shall be calibrated within the past 12 months by the manufacturer and have the latest version of software installed.

D. Fiber optic link testing.
   1. All testing of terminated fiber shall comply with and be tested to ANSI/TIA 568-B standards.
   2. Testing shall be performed on all terminated fibers with a Level III tester.
   3. The system loss measurements will be provided at 850 and 1310 nanometers for multimode fibers and 1310 and 1550 for single mode fibers.
   4. Fiber links will have a maximum loss of the following:
      a. Allowable cable loss per km) (km of fiber in link) + (.4dB) (number of connectors) = maximum allowable loss

b. A mated connector to connector interface is defined as a single connector for the purpose of this specification.
c. Taking the sum of the bi-directional measurements and dividing that sum by two will calculate loss numbers for the installed link.

5. Any link not meeting the requirements of the standard will be accurately documented and immediately communicated with the Owner Technology Projects Manager, the Architect, and the General Contractor. Failed or broken fiber strands will not be accepted.
6. Contractor will provide the fiber test results with the copper station cabling results.

E. In the event of a test failure, the Contractor will be required to repair and re-test the failed cable or terminated fiber before submitting test results to the A&E.

F. All test results shall be delivered in PDF format.

3.08 FIELD QUALITY CONTROL

A. Cable tray:
1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Site visits and final acceptance:
1. The Project Manager and/or Manufacturer System Manager shall perform on-going inspections during construction. All work shall be performed in a high-quality manner and the overall appearance shall be clean, neat and orderly.
2. Consultant shall provide overhead cabling inspections as directed by the General Contractor work schedule. During this time, all cable pathways in the required area shall be reviewed by the Technology Consultant. All identified areas of non-compliance with the contract documents shall be provided on a field report and distributed to the General Contractor, Contractor and the Owner.
3. Final acceptance site visits shall be performed by the Contractor(s), consultant and Owner to ensure all installed work area outlet locations are properly identified on the record drawings and that all labeling and terminations meet the requirements of the contract documents and industry standards.
4. Repeated site visits to review previously documented items shall be subject to strict limitations that shall result in the Contractor being charged on a time and mileage basis. Any documented item that requires more than two site visits by the consultant / Owner shall be subject to this penalty.

END OF SECTION

SECTION 27 4116

INTEGRATED AUDIO-VISUAL SYSTEMS

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.

B. Documents: Provisions of General Conditions, Supplementary Conditions, and the sections included under Procurement & Contract Requirements are included as part of this section as though bound herein.

1.02 SUMMARY

A. Section Includes
   1. Integrated Audio-Video Equipment Hardware
   2. Configuration Software
   3. Control Interfaces
   4. Power Supplies
   5. Television Displays

B. Related Requirements
   1. Section 01 0000 General Requirements
   2. Section 27 5116 Public Address Systems
   3. Section 28 0511 Cyber Security Requirements
   4. AVIXA Rack Building for Audiovisual System 2019
   5. AVIXA Cable Labeling for Audiovisual Systems
   6. AVIXA Audiovisual Systems Performance Verification
   7. ANSI/TIA-568 Commercial Building Telecommunications Cabling Standard
   8. ANSI/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces.
   9. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual.
   10. "Basic Principles for suspended Loudspeaker Systems", Technical Notes Volume 1, Number 19, JBL Professional or latest edition.
   11. "Handbook for Riggers" 1977 Revised Edition, Newberry, W.G., Calgary, Alberta Canada.
   12. Underwriters Laboratory (UL) listed and recognized equipment and materials.
   13. Americans with Disabilities Act (ADA)
   14. In the event of a conflict between documents referenced herein and the contents of this specification, the contents of this specification shall be considered the superseding document except for the ADA, NFPA and NEC publications.

1.03 DEFINITIONS

A. AVIXA: Trade association representing the professional audiovisual and information communications industries worldwide.

B. CTS: Certified Technology Specialist

C. EMI: Electromagnetic interference.

D. RBB: Rack bonding busbar. A busbar within a cabinet, frame, or rack.

E. RBC: Rack bonding conductor. Bonding conductor from the rack or rack bonding busbar to the telecommunications equipment bonding conductor.

F. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

G. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

H. S/FTP: Overall braid screened cable with foil screened twisted pair.

I. S/UTP: Overall braid screened cable with unscreened twisted pairs.

J. TBC: Telecommunication Bonding Conductor. The TBC bonds the AV-PBB to the service equipment (power) ground. Formerly known as the bonding conductor for telecommunications.

K. TEBC: Telecommunications equipment bonding conductor. A conductor that connects the primary bonding busbar, secondary bonding busbar or supplementary bonding network to equipment racks or cabinets, rack bonding busbars or rack bonding conductors.

L. Federal Communications Systems (FCC).

M. Institute of Electrical and Electronics Representatives (IEEE).

N. National Electrical Manufacturer's Association (NEMA).

O. National Fire Protection Association (NFPA) Publications (Latest revisions and pertinent addendums).

1.04 PERFORMANCE REQUIREMENTS

A. In the installation of this work, the Contractor shall comply with the requirements of Owner's standards, local and state laws and ordinances and the National Electrical Code.

B. Anything in the Drawings or Specifications that shall not comply with the above laws, ordinances, and rules, shall be referred to the attention of Owner's representatives for a decision before proceeding with that part of the work.

C. Performance References:
   1. The Contractor shall submit a minimum of three (3) references with names, addresses and telephone numbers of the operating personnel who can be contacted regarding previous installed systems of similar size and scope.
   2. Submitting incomplete or inaccurate reference information can be a reason to disqualify bidding Contractor.

1.05 SYSTEM & SUBSYSTEM REQUIREMENTS

A. Hardware: Contractor shall supply equipment, accessories, cables, and connectors necessary for system to operate according to stated functional requirements, whether said products are listed.

B. Software: Contractor shall utilize manufacturer's official and current version of configuration software at the time of installation.

C. Control Interfaces: Shall be labeled or configured with graphical user interface as appropriate.

D. Power Supplies: As required, Contractor shall provide necessary power supplies for devices requiring DC voltage.

E. Uninterruptible Power Supplies (UPS): Contractor shall provide a minimum of one managed UPS per audio-visual equipment rack for all pre-power amplifier equipment, whether specified or shown. Signal processing equipment and a minimal amount of audio amplifiers shall be connected to the UPS to allow for the Owner to announce emergency instructions of the audio-video system if desired.

F. Unless otherwise provided in the Specifications, reference to any equipment, material, article, or patented process, by trade name, make or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. If the respondent wished to make a substitution to the Specifications, the respondent shall furnish to the Representative Consultant the name of the manufacturer, the model number, and other identifying data and information necessary to aid the Representative Consultant in evaluating the substitution, and such substitution shall be subject to the Representative Consultant's approval. Substitutions shall be approved only if determined by the Representative Consultant to be equivalent to that specified. A proposal containing a substitution is subject to disqualification if the Owner's representative does not approve the substitution. Quantities of products shall be verified with drawings and any discrepancies reported to the Owner's representative in writing for resolution.

G. Unapproved product substitutions which have been provided and/or installed shall be replaced with the specified products at Contractor's sole expense.

H. Furnish all accessories necessary to integrate each piece of equipment into the system including rack mounts and other mounting devices, special connectors, and interfaces.

I. Coordinate with Architect the finish of all exposed items to blend with adjacent architectural elements of the building.

J. Major components of the system such as DSP, power amplifiers, mixer-preamplifiers, and tuners, shall have a device, whether internal or external, which provides protection against voltage spikes and current surges originating from commercial power sources.
   1.

1.06 QUALIFICATIONS

A. Contractor
   1. The Contractor must show proof that A/V system integration is the primary function of the company.
   2. The Contractor shall provide proof that it supports a well-trained maintenance force in the area local to the project.
   3. The Contractor must maintain a fully staffed installation and service facility equipped with appropriate test equipment for repair of systems such as those specified herein.
   4. The Contractor shall be, or have direct relations through their subcontractors, an approved manufacturer's representative for all products they furnish and install.
   5. The Contractor shall be certified by the manufacturing company in all aspects of design, installation, and able to provide warranty service of the products described herein.
   6. The Contractor shall utilize the authorized manufacturer components in provisioning this project.
   7. The Contractor shall show proof that it has been in the A/V system installation business for a period of not less than 3 years and has successfully, completed projects of equivalent size and scope.
   8. Contractor shall have a documented quality assurance program. This program shall have internal inspection team(s) to measure the service and product quality produced by the Contractor’s technicians against internal and Industry standards.
   9. Contractor shall comply with all federal, state and local statutes regarding qualifications of firms.
   10. The Contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size.
   11. The Contractor shall own and maintain tools and equipment necessary for successful installation of optical and Category 6/6A metallic premise distribution systems.
   12. The Contractor shall have personnel who are adequately trained in the usage of such tools and equipment.
   13. The use of uncertified subcontractors to the Contractor is not permitted.
   14. Contractor must provide on-site supervision and project management by person(s) with a minimum of AVIXA CTS certification.
   15. To facilitate timely service and warranty onsite requirements, the Contractor must have an established office located within 75 miles of the project.

B. Manufacturer
   1. Manufacturer shall have a minimum of ten (10) years’ experience in the manufacture of audio-video system products.
   2. Maintain a 24-hour toll free telephone assistance line or online presence for Owner and installer support.

1.07 SUBMITTALS

A. Action Submittals:
   1. Contractor shall submit an electronic PDF copy of the submittal package within 15 days of written notification to proceed or other written documentation from the Architect or General Contractor. Sheets within the PDF shall be organized into the following sections:
   2. Cover Sheet and Section 1 ─ Information, and Material

a. Cover sheet containing the Company Name and/or logo, Title of submittal package, project name, and Contractor work address with a point of contact (POC) and phone number.

3. Section 2 ─ Product Data
   a. Manufacturer's catalog information showing dimensions, colors, and configurations.
   b. Submittals shall include all items listed in PART 2 – PRODUCTS of this document and the Manufacturers cut sheets for the following:
      1) Manufacturers cut sheets for all products. Lengthy installation manuals shall not be submitted.
      2) In cases of multiple product numbers on a single cut sheet, the Contractor shall identify the proper part number with a black X, check mark, or highlight.

B. Informational Submittals:
1. Section 1 ─ Pre-Qualification Certificates
   a. Contractor shall submit the following documents:
      1) A letter of approval from the manufacturer indicating completion of pre-qualification requirements.
      2) Training certificates for design, representative and installation of the proposed products.
2. Section 2 ─ Warranty Documentation
   a. Provide example of documentation regarding the Contractor's warranty.
3. All submittals shall be delivered to the Architect without incomplete documentation. Submittals missing cut sheets, drawings, certification documents or are not properly filled out per this section shall be summarily rejected in whole. Supplying partial submittal packages for the purpose of ordering materials is not an approved practice and shall be rejected in whole.
4. The low voltage pre-construction meetings for all Division 11 (AV), 27 and 28 integrators shall be delayed until Contractor has received approved submittal packages from the Consultant.

C. Closeout Submittals:
1. Upon completion of final representative and incorporation of the Architect review comments, Contractor shall provide to the Architect for its records the following close out documentation:
2. Record or As Build Drawings which shall include but not limited to:
   a. Functional block diagrams for each integrated audio-video system.
   b. All integrated audio-video or audio-visual junction box locations.
   c. Audio visual equipment rack locations.
   d. Rack elevations.
      1) Rack elevations shall show all components as installed under this contract.
      2) Contractor shall label each component describing the component. (Examples: Cafeteria Amplifier or Gymnasium DSP etc.).
   e. Floor plan drawings with device locations and associated assigned item number.
   f. Mounting detail for equipment and hardware.
   g. Schedule of all devices with associated panel termination, zoning, power circuits, etc.
   h. Corrected product submittal information.
3. A complete inventory list of installed products shall include:
   a. Manufacturer name.
   b. Model number.
   c. Serial number.
   d. Room number and/or description of installed location.
4. Operation and Maintenance Manuals shall include:
   a. Include detailed procedures for system operation that begin with startup procedures and continue through system shut down referenced in section 3.3 Training.
   b. List of manufacture recommended maintenance and intervals with manufacture support contact information.

D. Drawings shall contain the Contractors own title block on the edge of the drawing and shall include the company name, address, phone number and date of the final drawings. Use of any part of the Architect title block is not acceptable at any time.

E. Drawing documentation shall be in the following format:
   1. Drawings shall be in both CAD (DWG) and PDF format.
   2. File transfer is acceptable.

F. Drawings shall be provided to the Architect two weeks prior to the final testing and commissioning of the system. Coordinate with the Owner during the pre-construction meeting for Contractor to schedule this delivery date.

G. The drawings shall be reviewed on site with the Architect and the Owner prior to the final acceptance process. Drawings rejected for any reason shall delay the final acceptance process until resolved.

H. Testing Results
   1. In addition to the project record drawings, the Contractor shall provide the testing information for all audio-visual cabling.
   2. Test results shall be provided to the Architect two weeks prior to the expected final acceptance of the system(s). Coordinate with the Owner during the pre-construction meeting for low voltage Contractors to schedule this delivery date.
   3. The drawings shall be reviewed on site with the Architect and the Owner prior to the final acceptance process. Test results rejected for any reason shall delay the final acceptance process until resolved.

1.08 QUALITY ASSURANCE

A. The Contractor is bound by the intent of these Specifications to provide a complete and functional audiovisual system that meets the requirements of AVIXA Audiovisual Systems Performance Verification including but not limited to:
   1. ICS control functionality, verification of presets, volume controls, mute controls, etc.
   2. Stable operation, completely free of feedback and distortion throughout the entire range of available ICS controls.
   3. Correct routing of all signals to intended destination.
   4. Unity gain structure.
   5. Output transducer (speaker protection processing functionality).
   6. Audio Echo Cancellation functionality

B. Provide measurement test results per ANSI/InfoComm 1m-2009 ACU.

C. Outdoor sound system measurements shall be provided at a minimum of one measurement per 50 seats. Measurements shall be performed using pink noise test signal at a volume congruent with nominal system operation. Measurements shall indicate:
   1. Site plan map of seating areas and test locations.
   2. Frequency response from 40Hz-16kHz in 1/3 octave resolution.
   3. SPL (A weighted) of the test signal as measured from each location.
   4. Weather condition at time of test; including temperature, humidity and average wind speeds.

D. Loudspeaker performance shall exhibit frequency response of +/-3dB from 40Hz to 8kHz throughout 70% of the listening area, and +/-6dB throughout the remaining listening area.

E. Provide all necessary labor, materials, tools, transportation, services, ancillary items and coordination to furnish the Owner a complete turnkey system as described herein.

F. The Owner's representative shall make regular progress inspections. The Contractor shall make their job supervisor available to assist during these visits.

G. The Contractor shall thoroughly familiarize themselves with the complete construction documents, to have visited all sites affecting the proposed work, studied bid package information and all necessary details of the complete set of drawings and Specifications and to have included in the proposal an amount to cover all work.

H. The Contractor shall keep a complete set of drawings, specification, reviewed submittals and progress markups on the job site always. These documents shall be made available during Owner's representative site progress visits. Changes made during installation shall be noted in the project markup set.

I. Submission of bids shall be deemed evidence of Contractor’s knowledge, review, and examination of the construction documents.

J. Provide a competent supervisor and supporting technical personnel with a minimum of AVIXA CTS certification and is acceptable to the General Contractor, Owner and Consultant during installation. Notify the Owner's representative in writing prior to any project supervisor replacement.

1.09 DELIVERY STORAGE AND HANDLING

A. Deliver, Storage and Protection
   1. Contractor shall verify all site conditions are suitable for delivery of product.
   2. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
   3. Contractor shall provide all equipment and materials necessary for the delivery of materials safely and securely on site.

1.10 PROJECT CONDITIONS

A. Damages
   1. The Contractor shall be liable for all damages to portions of the building caused by it, including but not limited to the following:
      a. Damage to any portion of the building caused by the movement of tools, materials or equipment.
      b. Damage to any component of the construction of spaces "turned over" to the Contractor.
      c. Damage to the electrical distribution system and/or other space "turned over" to the Contractor.
      d. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the Contractor or other actions of Contractor.

B. Other damage to the materials, tools and/or equipment of the Owner, its consultants, General Contractor, subcontractors, Architect, other Contractors, agents and lessees.

1.11 COORDINATION

A. Where connection between components or control features are accomplished over the Owner’s LAN, Contractor shall coordinate with the Owners IT department for IP addresses, firewall access, and other issues pertaining to successful integration.

B. Cooperate and coordinate as required with other Contractors who are responsible for work not included in this section.

C. Provide all information as required or requested by the Owner, Architect, Consultant or General Contractor for the project to be completed to the satisfaction of the Owner.

D. Notify General Contractor in a timely manner of system design or installation conflicts, which affect the intended use, or performance of the system.

E. Attend job construction and progress meetings that the Owner, GC, or Architect deems necessary.

1.12 WARRANTY

A. The Contractor shall warrant and guarantee all work against defects in material, equipment or workmanship for one (1) year from the date of substantial completion.

B. Provide manufacturer’s standard warranty on all products provided.

C. Upon receipt of written notice, Contractor shall remedy defects within thirty (30) days, or the Owner shall correct the defects and the Contractor, or its surety shall be liable for expenses.

1.13 BID

A. Contractor shall be required to provide the following documents with the bid response.
   1. Training certificates for design, engineering and installation of the proposed product types.
   2. A list of all current installations that shall be ongoing during this project, and the manpower requirements for each of those installations.
   3. Performance references as described herein. References with an invalid phone number shall be considered as an incomplete response and may be disqualified.
   4. Sample of the warranty that would be provided to the Owner when the installation is complete and documentation of the support procedure for warranty issues.
   5. Resume of qualification with the Contractor's bid proposal indicating the following:
      a. A technical resume of experience for the Contractor's Project Manager and on-site installation supervisor (Project Foreman) who shall be assigned to this project. The project manager shall have a minimum of 5 years' experience on projects of similar size and design. The Project Foreman shall have a minimum of 3 years related project experience working crews of 4 or more personnel with a minimum of AVIXA CTS certification.
      b. A list of technical product training attended by the Contractor's personnel that shall install the system.
      c. Any sub-Contractor who shall assist the primary Contractor in performance of this work shall have the same training and certification as the primary Contractor. The use of certified Subcontractors is not prohibited for this project.
      d.

PART 2 - PRODUCTS

2.01 CAFETERIA

A. The Cafeteria audio-video sound system shall be a separate and distinct system, connected to the Fire Alarm and main Public Address System for override announcement from main system only. The override shall MUTE the sound system output upon sense.

B. Audio-video equipment rack shall not be installed in a manner which obstructs the audience view when door is open.

C. EQUIPMENT RACK (ER-02)
   1. Contractor to reference AVIXA Rack Building for Audiovisual Systems 2019.
   2. Acceptable Manufacture: Middle Atlantic
   3. Acceptable Model: DWR-16-22PD
   4. Provide with the following accessories:
      a. PDX-920R
      b. D2
      c. Any and all blanks and vents such that there are no open spaces on front of rack.
      d. Horizontal and vertical cable management.

D. DSP:
   1. Acceptable Manufacturer: Extron
   2. Acceptable Model: DMP 128

E. CONTROL PROCESSOR:
   1. Provide web interface for remote operation of control features.
   2. Contractor to coordinate and complete the following owner meetings for approval of touch panel layouts, colors and graphics. The contractor may not complete installation of program on site without owner approval. Failure to do so may result in the Contractor providing programming labor for Owner or Consultant changes at their sole expense.
      a. Initial programming meeting to confirm control functionality.
      b. Provide examples of touch panel layout for approval by Owner and Architect of colors, buttons and graphics.
   3. The following functionality shall be provided as a minimum program scope.
      a. Projection screen up/down

b. Video Switcher inputs/outputs
c. Projector control
d. Mic / Line level control of available inputs
e. Monitor output level control
f. Master Volume Control

4. Acceptable Manufacturer: Atlona
5. Acceptable Model: AT-VGW-HW-3

F. TOUCH PANEL CONTROLLER (TP):
1. Acceptable Manufacturer: Atlona
2. Acceptable Model: AT-VTP-800

G. HDMI MATRIX SWITCHER:
1. Acceptable Manufacturer: Atlona
2. Acceptable Model: AT-UHD-CLSO-824

H. HDMI TX/RX KIT (AV-01):
1. Acceptable Manufacturer: Atlona
2. Acceptable Model: AT-HDVS-210H-TX-WP-KIT

I. AV SWITCH:
1. Acceptable Manufacturer: TP Link
2. Acceptable Model: TL-SG1008MP V3

J. WIRLESS MICROPHONE SYSTEM:
1. Provide remote antenna(s) for proper coverage and reception of wireless microphone transmitters (WA).
2. Contractor to confirm available local RF frequencies prior to purchasing to be certain that correct frequency bands will be installed for the areas surrounding the project.
3. Acceptable Manufacturer: Shure
4. Acceptable Models:
a. SLXD24D/B58 (Qty. 2)
b. SLXD1 Belt-Pack Transmitter (Qty. 4)
c. WL185 Lavaliere Microphone (Qty. 4)
d. UA221 Antenna Combiner (Qty. 2)
e. UA8XX Cable (Lengths as required) (Qty. 2)

K. MEDIA PLAYER:
1. Acceptable Manufacturer: Denon
2. Acceptable Model: DN-700CB

L. ASSISTED LISTENING SYSTEM:
1. Contractor shall verify, and provide, quantities of receivers according to current ADA laws.
2. Acceptable Manufacturer: Williams Sound
3. Acceptable Model: FM 558 Pro

M. AMPLIFIER:
1. Acceptable Manufacturer: Crown
2. Acceptable Model: DCi 2/300

N. WALL-MOUNTED COLUMN SPEAKERS (S2):
1. Acceptable Manufacturer: JBL
2. Acceptable Model: CBT 100LA-1-WH

O. PROJECTOR (VP):
1. Acceptable Manufacturer: Epson
2. Acceptable Model: EB-PU1008W
a. Provide with Middle-Throw Zoom Lens #1 (ELPLM08)

P. PROJECTOR MOUNTING HARDWARE:
   1. In addition to items listed below, contractor shall provide mounting pole of necessary length to mount projector at appropriate height along with hardware to affix projector and mounting equipment to building structure.
   2. Acceptable Manufacturer: Chief
   3. Acceptable Models:
      a. RPAU
      b. CMA480
      c. CMA345

Q. PROJECTOR SCREEN (PS):
   1. Integrate screen control with AV control system.
   2. Ceiling-mounted, motorized, 16:10, 165” diagonal.
   3. Acceptable Manufacturer: Draper
   4. Acceptable Model: 140040

R. OWNER TURNOVER EQUIPMENT:
   1. JBL JRX212M (QTY. 2)
   2. Shure SM58S (QTY. 2)
   3. RapcoHorizon Road Hog (25’ Black), (QTY. 4)
   4. Atlas MS-10CE (QTY. 2)

S. OFCI WIRELESS PRESENTATION DEVICE
   1. Contractor to provide labor and materials for the installation of the Owner-Furnished and Contractor-installed ViVi wireless presentation device.
   2. Contractor to provide HDMI patch cabling as required to be connected to HDMI input of the Matrix Switcher.

2.02 HUB

A. The HUB audio-video sound system shall be a separate and distinct system, connected to the Fire Alarm and the main Public Address System for override announcement from main system only. The override shall MUTE the sound system output upon sense.

B. Audio-video equipment rack shall not be installed in a manner which obstructs the audience view when door is open.

C. EQUIPMENT RACK (ER-01)
   1. Contractor to reference AVIXA Rack Building for Audiovisual Systems 2019.
   2. Acceptable Manufacturer: Middle Atlantic
   3. Acceptable Model: DWR-16-22PD
   4. Provide with the following accessories:
      a. PDX-920R
      b. D2
      c. Any and all blanks and vents such that there are no open spaces on front of rack.
      d. Horizontal and vertical cable management.

D. AUDIO VIDEO WALL INPUT / OUTPUT PLATES
   1. Acceptable Manufacturer: C2G
   2. Acceptable Model: 39870

E. RACK MOUNTED MIXER
   1. Acceptable Manufacturer: Shure
   2. Acceptable Model: SCM410

F. CONTROL PANEL
   1. Provide custom labels so that the end user can easily identify operation.
   2. Acceptable Manufacturer: Extron

3. Acceptable Model: MLC Plus 100

G. AUDIO AMPLIFIER
1. Acceptable Manufacturer: Extron
2. Acceptable Model: XPA U 1004

H. WIRELESS MICROPHONE SYSTEM
1. Provide remote antenna(s) for proper coverage and reception of wireless microphone transmitters.
2. Contractor to confirm available local RF frequencies prior to purchasing to be certain that correct frequency bands will be installed for the areas surrounding the project.
3. Acceptable Manufacturer: Shure
4. Acceptable Model: QLXD124/85

I. ASSISTED LISTENING SYSTEM
1. Contractor shall verify, and provide, quantities of receivers according to current ADA laws.
2. Acceptable Manufacturer: Williams Sound
3. Acceptable Transmitter Model: FM 558 Pro

J. PROJECTOR
1. Acceptable Manufacturer: NEC
2. Acceptable Model: NP-P554U

K. PROJECTOR MOUNT
1. Contractor to provide labor and materials to support the projector with mount from building structure.
2. Acceptable Manufacturer: Peerless
3. Acceptable Models:
   a. PJF2-UNV
   b. CMJ500

L. PROJECTOR SCREEN (PS):
1. Integrate screen control with AV control system.
2. Ceiling-mounted, motorized, 16:10, 165” diagonal.
3. Acceptable Manufacturer: Draper
4. Acceptable Model: 140040

M. PENDANT MOUNT SPEAKERS (S2)
1. Contractor shall securely fasten speakers from structural steel. Provide materials forged and made in the U.S.A with a minimum safety factor of 5:1.
2. Acceptable Manufacturer: Electro-Voice
3. Acceptable Model: EVID-P6.2

N. DUCKING MODULE
1. Acceptable Manufacturer: Bogen
2. Acceptable Model: VAR1

O. AUDIO DSP
1. Acceptable Manufacturer: Extron
2. Acceptable Model: DMP 44 LC

P. IN TILE SPEAKERS (S2-01)
1. Acceptable Manufacturer: Electro-Voice
2. Acceptable Model: EVID C6.2

Q. OFCI WIRELESS AUDIO-VIDEO PRESENTATION
1. Contractor to provide labor and materials for the installation of the Owner Furnished and Contractor installed ViVi wireless audio-video receiver.

2. Contractor to provide HDMI patch cabling as required to be connected to input 1 of the video projector and input 2 be connected to the AV wall plate.
3. Acceptable Mounting Hardware: Roemtech
4. Acceptable Model: MagnaKlamp MK-2N

2.03 GYMNASIUM

A. The Gymnasium sound system shall be a separate and distinct system, connected to the main P.A. and intercom system for override announcement from main system only. The audio cabinets shall be permanently affixed, where shown. Do not install cabinet in a manner which obstructs the audience view when door is open.

B. EQUIPMENT RACK (ER-03)
   1. Contractor to reference AVIXA Rack Building for Audiovisual Systems 2019.
   2. Acceptable Manufacturer: Middle Atlantic
   3. Acceptable Model: DWR-16-22PD
   4. Provide with the following accessories:
      a. PDX-920R
      b. D2
      c. Any and all blanks and vents such that there are no open spaces on front of rack.
      d. Horizontal and vertical cable management.

C. WIRELESS MICROPHONE SYSTEM
   1. Provide remote antenna(s) for proper coverage and reception of wireless microphone transmitters.
   2. Contractor to confirm available local RF frequencies prior to purchasing to be certain that correct frequency bands will be installed for the areas surrounding the project.
   3. Acceptable Manufacturer: Shure
   4. Acceptable Models:
      a. QLXD14/SM35
      b. QLXD2/SM58
      c. UA507

D. DIGITAL SIGNAL PROCESSOR (DSP)
   1. DSP configuration must allow for sensing of two remote relay commands. One from sound and program extension as well as fire alarm systems.
   2. Sound and Program Extension remote relay cabling provided by Division 27 4116 Contractor.
   3. Fire Alarm remote relay cabling provided by Division 27 4116.
   4. Acceptable Manufacturer: Extron
   5. Acceptable Model: DMP-64

E. MEDIA PLAYER
   1. Acceptable Manufacturer: Denon
   2. Acceptable Model: DN-300Z

F. AUXILLARY AUDIO INPUT PLATE:
   1. Acceptable Manufacturer: ProCo
   2. Acceptable Model: I-Rack

G. AMPLIFIER
   1. Acceptable Manufacturer: Crown
   2. Acceptable Models: DCI 2/600

H. ASSISTED LISTENING SYSTEM
   1. Contractor shall verify, and provide, quantities of receivers according to current ADA laws.
   2. Acceptable Manufacturer: Williams Sound
   3. Acceptable Transmitter Model: FM 558 Pro

I. MIXER
   1. Acceptable Manufacturer: Denon
   2. Acceptable Model: DN-312X

J. CENTER-HUNG SPEAKER ARRAY (S3)
   1. Provide and install a self-contained, wide frequency range loudspeaker with a hemispherical coverage pattern.
   2. Speaker home-run cable shall be continuous. Mid-span splices are not acceptable.
   3. Measure and record home-run impedance and include in as built documentation.
   4. Coordinate with architect the finish of all exposed speakers to blend with adjacent architectural elements of the building.
   5. Acceptable Manufacturer: Octasound
   6. Acceptable Model: SP520A

K. OWNER TURN OVER EQUIPMENT
   1. Shure SM58S (QTY. 1)
   2. Valcom V-400 (QTY. 1)
   3. JBL JRX212M (QTY. 2)
   4. RapcoHorizon Road Hog (25’ Black), quantity (2)
   5. Atlas MS-10CE (QTY. 1)

2.04 FIRESTOPPING

A. Provide products in compliance with local AHJ.

B. 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. STI
   2. Hilti
   3. 3M
   4. Approved equivalent

2.05 WIRE AND CABLE

A. ACCEPTABLE MANUFACTURERS
   1. Belden
   2. West Penn
   3. Crestron
   4. Extron
   5. Liberty
   6. Windy City Wire

B. JACKS, CONNECTORS AND WALLPLATES
   1. All custom A/V panels shall be minimum 1/8" brushed aluminum with engraved paint filled legends unless otherwise noted.
   2. All AV connectors shall be Neutrik or Switchcraft brand (non-crimp) or approved alternative.
   3. All HDBaseT and AV/IP connectors shall be Leviton or approved alternative.

PART 3 - EXECUTION

3.01 INSTALLATION AND PROGRAMMING

A. General Installation Expectations:
   1. The Contractor shall provide and install a complete and functional audio-video system as specified within. The system shall be free from all defects, buzzes and hums.
   2. If, in the opinion of the Contractor, there is anything in the Drawings or Specifications that shall not strictly comply with the ordinances, and rules, the matter shall be referred to the attention of Owner’s representatives for a decision before proceeding with that part of the work. No change

in the Drawings or in the Specifications shall be made without full consent in writing by the Owner's representative.

3. The Contractor shall obtain the Owner's permission before proceeding with any work necessitating cutting into or through any part of building structures such as girders, beams, concrete or tile floors, partition ceilings.
4. Contractor shall provide components, wire, connectors, materials, parts, equipment and labor necessary for the complete installation of the system, in full accordance with the recommendations of the equipment manufacturers and the requirements, Specifications and all applicable codes.
5. The Contractor shall be responsible for providing firestopping services for required audio-vdieo cable pathways.
6. The Contractor shall take necessary steps to ensure that the required firefighting apparatus is accessible always. Flammable materials shall be kept in suitable places outside the building.
7. The Contractor shall install the materials in accordance with the manufacturer's specifications.
8. Equipment shall be held firmly in place with manufacturers' recommendation and/or EIA standard types of mounting hardware. All equipment shall be installed to provide reasonable safety for the operator.
9. The Contractor shall promptly correct all defects for which the Contractor is responsible.
10. The Contractor shall ensure that all records and reports, City relations, engineering, metering, inspections, testing, quality or service standards and safety measures comply with standards applicable for the State where the work is being performed.
11. The Contractor shall coordinate all work with the Owner's assignee or as shall be designated at a future date.
12. The Contractor shall remove all excess material and debris and return to its original state of cleanliness. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap wire, etc., and dispose of such items daily.
13. Upon completion of installation and prior to acceptance, all equipment shall be thoroughly cleaned and made free from extraneous bits of soldier, wire, etc. by the Contractor. Contractor shall clean up work area and remove ALL waste and trash. Debris resulting from the installation shall be removed from all areas and disposed of by the Contractor.
14. It shall be the responsibility of the installation Contractor to furnish any special installation equipment or tools necessary to properly complete the installation.
15. The Contractor shall not roll or store cable reels without an appropriate underlay.
16. The Contractor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.
17. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded at any time during the placement facilities. Failure to follow the appropriate guidelines may require the Contractor to provide additional material and labor necessary to properly rectify the situation. This shall also apply to all damages sustained to the cables by the installation Contractor during the implementation.
18. All wiring, materials, and equipment must be listed and labeled by a nationally recognized testing laboratory.
19. All wiring, materials, and equipment must be suitable for the environment they are to be permanently installed in.
20. All equipment proposed by the Contractor must be new and unused. Equipment refers to all hardware, software, equipment, cabling, materials and incidentals etc.
21. Provide manufacturer's original box or shipping container from one (1) of every serialized.
22. All work shall be done in a thorough and conscientious manner according to industry standards and shall be subject to inspection and acceptance.
23. An appropriate construction schedule shall be developed by the Contractor and shall be subject to approval by the Owner's representatives. The construction schedule shall include at least one installation supervisor, or lead technician, for on-site management of the project.

24. Prior to starting the installation, the assigned installation supervisor, or lead technician, shall participate in a "walk-through" of the project location with the Owner's representatives to review the installation documentation, verify that all construction necessary for the installation has been completed, and verify all installation methods and cable routes.
25. The Contractor shall be responsible for completing a standardized report form addressing the weekly progress of the installation schedule.
26. The Contractor shall maintain conductor polarity identification at the main equipment room, backbone, and horizontal connections in accordance with industry practices.
27. The Contractor shall provide any necessary screws, anchors, clamps, tie wraps, distribution rings, power supplies, miscellaneous grounding and support hardware, etc., necessary to facilitate the installation of the system.
28. The Contractor shall coordinate all final power requirements, conduits, and conduit sleeves prior to rough in installation.
29. The Contractor shall be responsible for installation of proper grounding and bonding.
30. The Contractor shall be responsible for labeling all cable, distribution frames, and outlet locations, according to industry and Owner standards.
31. It shall be the responsibility of the installation Contractor to furnish any special installation equipment or tools necessary to properly complete the installation.
32. The Contractor shall not roll or store cable reels without an appropriate underlay.
33. The Contractor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.
34. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded at any time during the placement facilities. Failure to follow the appropriate guidelines may require the Contractor to provide additional material and labor necessary to properly rectify the situation. This shall also apply to any and all damages sustained to the cables by the installation Contractor during the implementation.
35. Materials shall be consistent throughout the building. Where two or more units of the same class of equipment are required, these units shall be the product of a single manufacturer and shall be the same product with the same material, model, and manufacturer number.
36. Wiring, materials, and equipment shall be delivered and stored in a clean dry space. They shall be properly packaged in factory fabricated type containers and protected from damaging fumes, construction debris and traffic until job completion.
37. All installation techniques and fixtures shall result in ease of maintenance and ready access to all components for testing measurements. All external screws, nuts, and locking washers shall be stainless steel. No self-tapping screws shall be used unless specifically approved by the Owner's representatives. All parts shall be made of corrosion resistant material, such as plastic, anodized aluminum or brass. All materials used in installation shall be resistant to fungus growth and moisture deterioration. An inert dielectric material shall separate dissimilar metals apt to corrode through electrolysis under the environmental operating conditions specified.
38. The Contractor shall submit for approval, a detailed description of the procedures and equipment included for the complete operational installation.

B. Control Systems
   1. Contractor shall meet with Owner and whomever the Owner deems appropriate to discuss control features and navigation. Once agreement is received on the control navigation, the Contractor shall submit detailed documentation and GUI configuration and programming for approval. This process shall continue until Contractor obtains documented approval from the Owner for control design. Contractor shall provide reasonable hours for changes once the system is operational to ensure the Owner's satisfaction. The control software shall be delivered to the Owner upon substantial completion of the project.

C. Wiring Plan Requirements
   1. Distribution of the cabling shall be accomplished through cable trays, conduit raceways, ducts, core-holes, extended columns, false half columns and plenums. Cabling shall be run at right

angles from cable trays. Horizontal cable segments shall be placed in cable trays and with cable exits/entrances supported by distribution rings or J Hooks. Cable may not rest on ceiling tile, be supported on existing ducting, tied, or supported by fire alarm, security or electrical infrastructure nor interlaced with existing cable.

2. The Contractor shall be responsible for providing an approved ground at all equipment locations. The Contractor shall also be responsible for ensuring ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes, and frameworks. All grounds shall consist of a minimum of 12 AWG copper wire or larger as required by code and shall be supplied from an approved building ground and bonded to the main electrical ground.
3. Observe proper circuit and loudspeaker wiring polarity. Properly and clearly label connections and wires as to function and polarity. No cables shall be wired with polarity reversal between connectors, at either end. Take care when wiring microphone cables to ensure that constant polarity is maintained.
4. Contractor is responsible for coordinating final cable pathways and necessary conduit sleeves.
5. Minimum Specifications:
    a. All wire and cable shall be UL approved, meet all national, state, and local codes, and manufacturers recommendations for connected components for its intended application.
    b. Plenum Insulation shall be rated for a minimum of 300 volts and satisfy the Underwriters Laboratories (UL) listed fire rated cable insulation requirements in plenum areas.
    c. Cable runs shall be continuous runs. Mid-span cable splicing is not acceptable.
    d. Any pulling compound or lubricant used in cable installation shall not deteriorate the conductor or the insulation.
    e. Under carpet wiring and flat wiring shall not be used.
    f. Manufacturer’s recommended cabling supersedes wire specified in this section.
    g. Contractor responsible for verifying all plenum rated spaces prior to installation. Provide Plenum rated cable as required.
    h. Contractor to verify and provide cabling that is applicable to its installed environment.
    i. All Pre-Amplifier audio cables shall be balanced unless otherwise noted.
6. HDBaseT AND AVoIP CABLES
    a. CAT6 or better
    b. Ensure that the cables pairs remain twisted together for canceling out Electromagnetic Interference (EMI) from the external sources are not exposed even partially, as it results in EMI issues.
    c. Use cables that are resistive to bend loss if excessive bending of cables cannot be prevented due to installation constraints.

D. Cable Management
1. The bend radius for twisted-pair cables is standardized at 12” (3” diameter).
2. Bundle cables within the guidelines of 2005 National Electrical Code (NEC) in Article 310.15(B)(2).
3. Avoid mounting the cabling components in places that block accessibility to other equipment (such as a power strip or fans) in and out of the racks.
4. Avoid
    a. Applying extra twists.
    b. Pulling or stretching beyond the specified pulling load rate.
    c. Bending it beyond the specified bend radius, and not beyond 90º.
    d. Creating tension in the suspension runs.
    e. Stapling or applying pressure with the cable ties.
5. Avoid exposing cables to areas of condensation and direct sunlight.
6. Remove any abandoned cables, as they restrict the airflow, and contribute to the possible increase in the operational temperatures, which can affect the durability of the system.
7. The NEC (NFPA 70), Article 800.133 (2005 NEC) indicates the separation requirements. This section of the NEC specifies the following: Communication wires and cables shall be separated

at least 50 mm (2 inches) from conductors of any electric, power, Class 1, non-power limited fire alarm, or medium-power network-powered broadband communication circuits. However, there are multiple exceptions to this generic rule, so refer to the NEC (NPFA 70) standard for more information.

8. All cabling shall have machine generated labels self-laminating. Handwritten labels shall not be accepted.
9. No cable ties shall be allowed on any low voltage cabling.

E. Rack Dressing
1. All Racks require Lacer Bars or Strips to provide clean cable management withing the rack.
2. All racks require the cable segregation of AC cables, Speaker Cables, low impedance balanced cabling and twisted pair cables.
3. No Cable Ties; Velcro only.

F. Identification, Labeling and Documentation
1. The Contractor shall label all termination devices, panels, enclosures, and equipment rooms. The Contractor shall mark each unit with permanently attached, self-laminating markings that shall not impair the equipment or present a hazard to maintenance personnel.
2. Place wire identification numbers on each end of all conductors. Install markers to be readable from left to right or top to bottom. Wire numbers shall be computer printed and self-laminating. Handwritten labels are not acceptable.
3. Mark all spare conductors and coil neatly located at the bottom of the equipment rack.
4. The contractor shall label power cables near the plug end. Label shall match equipment permanent label or function.

3.02 TESTING REQUIREMENTS

A. The Contractor shall perform sample tests in the presence of the Owner's representatives. Performing the testing procedures specified herein assures that the equipment and interconnection meets the performance characteristics specified. If testing indicates that the performance characteristics are not met, the test shall be declared a failure. The communication equipment and interconnection cabling shall be modified and/or repaired accordingly. The failed test and any other test that may be affected by the modification and/or repair shall be rerun. After all components have been installed, the integrity of the equipment and interconnection cabling shall be verified.

B. If a system test fails because of any component(s) in the system, the failed component(s) shall be corrected or substituted with other components and the tests shall be repeated. If a component has been modified because of the system test failure, a report shall be prepared and delivered to Owner's Representatives prior to retesting. The Contractor shall prepare and submit all test procedures and data forms for the post installation and system test to the Owner's representatives.

C. The test report shall contain the description of all tests performed, the results obtained, and any required adjustments or modifications necessary because of testing and installation. This report shall reflect the as-built communication equipment and interconnection cabling. An authorized representative of the Contractor shall sign the test report. At least three copies of the test report shall be sent to the Owner's representatives prior to scheduling of Final Observations.
1. Sample Test Report:

ITEM	ROOM/AREA	INPUT / OUTPUT	SOURCE	TEST RESULT	RECOMMENDED CORRECTIVE ACTION
1	Cafeteria Stage	AV-01 HDMI IN	Tech Laptop	No image displayed.	Verify HDBaseT connectivity on 12/25/19.

D. The test procedures shall have the Owner's representative's approval before the tests.

E. Contractor shall demonstrate to the Owner's representatives that the equipment operates as specified and that the tests meet performance requirements.

F. The Contractor shall ensure that the equipment is in first-class working condition and free of short circuits, ground loops, parasitic oscillations, excessive hum, RF interference, or instability of any form.

G. The Contractor shall test each operational component and adjust for equal sound levels at a given volume setting and replace defective items.

H. Contractor shall ensure that all loudspeaker and distributed audio systems described herein are balanced and optimized for maximum quality sound and coverage of listening areas.

3.03 TRAINING

A. Owner and end user training shall be videotaped and provided to the Owner as project closeout documentation.

B. System training shall be provided for the operator/user and technical staff in separate training meetings.
   1. Owner and end user training shall be held at Owner's convenience and to the Owner's satisfaction.
   2. Technical operation and maintenance training shall be held at Owner's convenience and to the Owner's satisfaction.
   3. The Contractor shall provide documentation demonstrating the Owner and/or Owner's Representatives understand the operation and maintenance of the system.

C. Complete operation and maintenance manuals and preliminary as-built drawings shall be delivered to the Owner one week prior to training sessions.

D. Operator/user training shall minimally consist of:
   1. Provide printed reference material for each trainee that documents and explains in layman's terms:
      a. System block diagram
      b. Normal day-to-day operation
      c. Operator selectable features
   2. Provide a hands-on training with Q & A session.

E. Technical Operations and Maintenance training shall consist of :
   1. The technical explanation shall be sufficiently thorough that staff personnel shall be able to make any programming changes required, analyze malfunctions and make equipment substitutions or bypasses necessary to maintain system operation except for the malfunctioning equipment or circuits.
   2. Provide printed reference material for each trainee that documents and explains in technical terms :
      a. System block diagram with technical features
      b. Technical operation, adjustments and programming
      c. System features and programming
      d. Review of as-built drawings.
   3. Provide a hands-on training with Q & A session.

F. Contractor shall provide a complete and comprehensive list of the maintenance schedule for all installed and/or provided equipment. The list shall be provided in both printed and Adobe Acrobat formats.

3.04 ACCEPTANCE OF SYSTEMS

A. Specifications set forth for construction of the system have been devised to ensure system compatibility and performance. Compliance with these Specifications shall be determined during periodic observations of construction. Repeated failure to comply with the specification shall be considered before the initial acceptance phase of the plant commences.

B. Prior to the Contractor performing final testing, deliver preliminary as-build documents and system testing documentation to Owner for use in conducting testing observation.

C. Once accepted by the Architect and Owner all documentation / program code becomes the property of the Owner.

D. Within ten days of receipt of the final acceptance notice, the Owner's representatives shall schedule and perform the final inspection. When the work is found acceptable under the contract documents and the contract is fully performed, declare substantial completion of the project.

END OF SECTION

SECTION 27 5116

PUBLIC ADDRESS SYSTEMS

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.

B. Documents: Provisions of General Conditions, Supplementary Conditions, and the sections included under Procurement & Contract Requirements are included as part of this section as though bound herein.

C. 28 0511 – Cyber Security Requirements

1.02 SUMMARY

A. Section Includes

1. Public Address Systems Equipment Hardware
2. Configuration Software
3. Control Interfaces
4. Power Supplies

B. Related Requirements

1. Section 11 5200 Audio-Video Equipment
2. Section 27 4116 Integrated Audio-Video Systems
3. Section 28 0511 Cyber Security Requirements
4. AVIXA Rack Building for Audiovisual System 2019
5. AVIXA Cable Labeling for Audiovisual Systems
6. ANSI T1.404 (DS3) and CATV Applications.
7. ANSI S4.48-1992
8. ANSI X3T9.5 TPPMD.
9. American Society of Testing and Materials (ASTM).
10. TIA (Telecommunications Industries Association & EIA (Electronic Industries Alliance)
11. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual.
12. Federal Communications Systems (FCC).
13. Institute of Electrical and Electronics Engineers (IEEE).
14. National Electrical Code (NEC) (Latest revision and pertinent addendums).
15. National Electrical Manufacturer’s Association (NEMA).
16. National Fire Protection Association (NFPA) Publications (Latest revisions and pertinent addendums).
17. "Basic Principles for suspended Loudspeaker Systems", Technical Notes Volume 1, Number 19, JBL Professional or latest edition.
18. "Handbook for Riggers" 1977 Revised Edition, Newberry, W.G., Calgary, Alberta Canada.
19. Underwriters Laboratory (UL)
20. Americans with Disabilities Act (ADA)
21. In the event of a conflict between documents referenced herein and the contents of this specification, the contents of this specification shall be considered the superseding document except for the ADA, NFPA and NEC publications.

1.03 DEFINITIONS

A. AVIXA: Trade association representing the professional audiovisual and information communications industries worldwide.

B. CTS: Certified Technology Specialist

C. EMI: Electromagnetic interference.

D. AV-PBB: Primary bonding busbar. A busbar placed in a convenient and accessible location and bonded, by means of the telecommunications bonding conductor, to the building's service equipment (power) ground (formerly known as the telecommunications main grounding busbar).

E. RBB: Rack bonding busbar. A busbar within a cabinet, frame, or rack.

F. RBC: Rack bonding conductor. Bonding conductor from the rack or rack bonding busbar to the telecommunications equipment bonding conductor.

G. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

H. AV-SBB: Secondary bonding busbar.

I. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

J. S/FTP: Overall braid screened cable with foil screened twisted pair.

K. S/UTP: Overall braid screened cable with unscreened twisted pairs.

L. TBC: Telecommunication Bonding Conductor. The TBC bonds the AV-PBB to the service equipment (power) ground. Formerly known as the bonding conductor for telecommunications.

M. TEBC: Telecommunications equipment bonding conductor. A conductor that connects the primary bonding busbar, secondary bonding busbar or supplementary bonding network to equipment racks or cabinets, rack bonding busbars or rack bonding conductors.

1.04 PERFORMANCE REQUIREMENTS

A. The Contractor must be an experienced Public Address System Contractor that is primarily engaged in the business of public address system integration.

B. The Contractor must show proof that Public Address System integration is the primary function of the company.

C. The Contractor will provide proof that it supports a well-trained maintenance force in the area local to the project.

D. The Contractor must maintain a fully staffed installation and service facility equipped with appropriate test equipment for repair of systems such as those specified herein.

E. Provide a competent supervisor and supporting technical personnel certified by the specified manufacturer and is acceptable to the General Contractor, Owner and Architect during installation. Notify the Owner's representative in writing prior to any project supervisor replacement.

F. The Contractor shall be, or have direct relations through their subcontractors, an approved manufacturer's representative for all products they furnish and install.

G. In the installation of this work, the Contractor shall comply in every way with the requirements of Owner's standards, local and state laws and ordinances, the National Board of Fire Underwriters, and the National Electrical Code. If, in the opinion of the Contractor, there is anything in the plans or specifications that will not comply with the above laws, ordinances, and rules, the matter shall be referred to the attention of customer's representatives for a decision before proceeding with that part of the work. No change in the plans or in the Specifications shall be made without full consent in writing by the Owner's representative's engineer.

H. References:

1. The Contractor shall submit a minimum of three (3) references with names, addresses and telephone numbers of the operating personnel who can be contacted regarding previous installed systems of similar size and scope.
2. Submitting incomplete or inaccurate reference information can be a reason to disqualify bidding Contractor.

1.05 CONTRACTOR QUALIFICATIONS

A. The Contractor selected to provide the installation of this system shall be certified by the manufacturing company in all aspects of design, installation, and able to provide warranty service of the products described herein.

B. The Contractor shall utilize the authorized manufacturer components in provisioning this Project.

C. The Contractor shall show proof, as part of the bid, that it has been in the public address system installation business for a period of not less than 3 years and has successfully, completed projects of equivalent size and scope.

D. Contractor shall have a documented quality assurance program. This program shall have internal inspection team(s) to measure the service and product quality produced by the Contractor's technicians against internal and Industry standards.

E. Contractor shall comply with all federal, state and local statutes regarding qualifications of firms.

F. The Contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size.

G. The Contractor shall own and maintain tools and equipment necessary for successful installation of optical and Category 6/6A metallic premise distribution systems.

H. The Contractor shall have personnel who are adequately trained in the usage of such tools and equipment.

I. Owner reserves the right to reject bid of any bidder who has previously failed to perform properly, or complete on time, contracts of a similar nature.

J. The use of subcontractors to the communications cabling Contractor is not permitted.

1.06 SUBMITTALS

A. Action Submittals

B. Informational Submittal:
1. Successful Contractor shall submit an electronic PDF copy of the submittal package within 15 days of written notification to proceed or other written documentation from the Architect or General Contractor. Binders shall be organized into the following sections:
2. Cover Sheet and Section 1 ─ Information, Pricing and Material
    a. Cover sheet containing the Company Name and/or logo, Title of submittal package, client name, and Contractor work address with a point of contact (POC) and phone number.
3. Section 2 ─ Product Data
    a. Manufacturer's catalog information showing dimensions, colors, and configurations.
    b. Submittals shall include all items listed in PART 2 – PRODUCTS of this document and the manufacturers cut sheets for the following:
        1) Manufacturers cut sheets for all products.
        2) In cases of multiple product numbers on a single cut sheet, the Contractor shall identify the proper part number with a black X or check mark.
4. Section 3 ─ Pre-Qualification Certificates
    a. Contractor shall submit the following documents with project proposal:

1) A letter of approval from the manufacturer indicating completion of pre-qualification requirements.
2) Training certificates for design, engineering and installation of the proposed products.

5. Section 4 ─ Warranty Documentation
   a. The warranty shall be for the life of the installed product.
   b. Complete documentation regarding the manufacturer's warranty shall be submitted as part of the proposal. This shall include but is not limited to a sample of the warranty that would be provided to the customer when the installation is complete and documentation of the support procedure for warranty issues.
6. All submittals shall be delivered to the Architect without incomplete documentation. Submittals missing cut sheets, drawings, certification documents or are not properly filled out per this section shall be summarily rejected in whole. Supplying partial submittal packages for the purpose of ordering materials is not an approved practice and shall be rejected in whole.
7. The low voltage pre-construction meetings for all Division 11 (AV), 27 and 28 integrators shall be delayed until all sub-Contractors have received approved submittal packages from the Consultant.

C. Closeout Submittals:
1. Upon completion of final representative and incorporation of the Architect review comments, Contractor shall provide to the Architect for its records the following close out documentation:
2. Record or As Build Drawings which shall include but not limited to:
   a. Functional block diagrams for each integrated audio-video system.
   b. All integrated audio-video or audio-visual junction box locations.
   c. Audio visual equipment rack locations.
   d. Rack elevations.
      1) Rack elevations shall show all components as installed under this contract.
      2) Contractor shall label each component describing the component. (Examples: Cafeteria Amplifier or Gymnasium DSP etc.).
   e. Floor plan drawings with device locations and associated assigned item number.
   f. Mounting detail for equipment and hardware.
   g. Schedule of all devices with associated panel termination, zoning, power circuits, etc.
   h. Corrected product submittal information.
3. A complete inventory list of installed products shall include:
   a. Manufacturer name.
   b. Model number.
   c. Serial number.
   d. Room number and/or description of installed location.
4. Operation and Maintenance Manuals shall include:
   a. Include detailed procedures for system operation that begin with startup procedures and continue through system shut down referenced in section 3.3 Training.
   b. List of manufacture recommended maintenance and intervals with manufacture support contact information.

D. Drawings shall contain the Contractors own title block on the edge of the drawing and shall include the company name, address, phone number and date of the final drawings. Use of any part of the Architect title block is not acceptable at any time.

E. Drawing documentation shall be in the following format:
1. Drawings shall be in both CAD (DWG) and PDF format.
2. File transfer is acceptable.

F. Drawings shall be provided to the Architect two weeks prior to the final testing and commissioning of the system. Coordinate with the Owner during the pre-construction meeting for Contractor to schedule this delivery date.

G. The drawings shall be reviewed on site with the Architect and the Owner prior to the final acceptance process. Drawings rejected for any reason shall delay the final acceptance process until resolved.

H. Testing Results
   1. In addition to the project record drawings, the Contractor shall provide the testing information for all audio-visual cabling.
   2. Test results shall be provided to the Architect two weeks prior to the expected final acceptance of the system(s). Coordinate with the Owner during the pre-construction meeting for low voltage Contractors to schedule this delivery date.
   3. The drawings shall be reviewed on site with the Architect and the Owner prior to the final acceptance process. Test results rejected for any reason shall delay the final acceptance process until resolved.

I. Closeout Submittals:
   1. Upon completion of final representative and incorporation of the Architect review comments, Contractor shall provide to the Architect for its records the following close out documentation:
   2. Record or As Build Drawings which shall include but not limited to:
      a. Functional block diagrams for each integrated audio-video system.
      b. All integrated audio-video or audio-visual junction box locations.
      c. Audio visual equipment rack locations.
      d. Rack elevations.
         1) Rack elevations shall show all components as installed under this contract.
         2) Contractor shall label each component describing the component. (Examples: Cafeteria Amplifier or Gymnasium DSP etc.).
      e. Floor plan drawings with device locations and associated assigned item number.
      f. Mounting detail for equipment and hardware.
      g. Schedule of all devices with associated panel termination, zoning, power circuits, etc.
      h. Corrected product submittal information.
   3. A complete inventory list of installed products shall include:
      a. Manufacturer name.
      b. Model number.
      c. Serial number.
      d. Room number and/or description of installed location.
   4. Operation and Maintenance Manuals shall include:
      a. Include detailed procedures for system operation that begin with startup procedures and continue through system shut down referenced in section 3.3 Training.
      b. List of manufacture recommended maintenance and intervals with manufacture support contact information.

J. Drawings shall contain the Contractors own title block on the edge of the drawing and shall include the company name, address, phone number and date of the final drawings. Use of any part of the Architect title block is not acceptable at any time.

K. Drawing documentation shall be in the following format:
   1. Drawings shall be in both CAD (DWG) and PDF format.
   2. File transfer is acceptable.

L. Drawings shall be provided to the Architect two weeks prior to the final testing and commissioning of the system. Coordinate with the Owner during the pre-construction meeting for Contractor to schedule this delivery date.

M. The drawings shall be reviewed on site with the Architect and the Owner prior to the final acceptance process. Drawings rejected for any reason shall delay the final acceptance process until resolved.

N. Testing Results

1. In addition to the project record drawings, the Contractor shall provide the testing information for all audio-visual cabling.
2. Test results shall be provided to the Architect two weeks prior to the expected final acceptance of the system(s). Coordinate with the Owner during the pre-construction meeting for low voltage Contractors to schedule this delivery date.
3. The drawings shall be reviewed on site with the Architect and the Owner prior to the final acceptance process. Test results rejected for any reason shall delay the final acceptance process until resolved.

1.07 QUALITY ASSURANCE

A. The Contractor is bound by the intent of these specifications to provide a complete and functional Integrated Public Address System as described herein which meets or exceeds all standard currently established for such systems, regardless of any errors or omissions.

B. Verification of presets, volume controls, mute controls, etc.

C. Stable operation, completely free of feedback and distortion throughout the entire system.

D. Correct routing of all signals to intended destinations and zones.

E. Output transducer (speaker protection processing functionality).

F. Loudspeaker performance shall exhibit frequency response of +/-3dB from 40Hz to 8kHz throughout 70% of the listening area, and +/-6dB throughout the remaining listening area.

G. Provide all necessary labor, materials, tools, transportation, services, ancillary items and coordination to furnish the Owner a complete turnkey system as described herein.

H. The Owner's representative will make regular progress inspections. The Contractor shall make their job supervisor available to assist during these visits.

I. The Contractor shall thoroughly familiarize themselves with the complete construction documents, to have visited all sites affecting the proposed work, studied bid package information and all necessary details of the complete set of drawings and specifications and to have included in the proposal an amount to cover all work.

J. The Contractor shall keep a complete set of drawings, specification, reviewed submittals and progress markups on the job site always. These documents shall be made available during Owner's representative site progress visits. Changes made during installation shall be noted in the project markup set.

K. Submission of bids shall be deemed evidence of Contractor’s knowledge, review, and examination of the construction documents.

L. In the event of a conflict between documents referenced herein and the contents of this specification, the contents of this specification shall be considered the superseding document except for the NFPA publications, which shall have precedence.

1.08 DELIVERY STORAGE AND HANDLING

A. Deliver, Storage and Protection

1. Contractor shall verify all site conditions are suitable for delivery of product.

2. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
3. Contractor shall provide all equipment and materials necessary for the delivery of materials safely and securely on site.

1.09 PROJECT CONDITIONS

A. Damages
1. The Contractor shall be liable for all damages to portions of the building caused by it, including but not limited to the following:
   a. Damage to any portion of the building caused by the movement of tools, materials or equipment.
   b. Damage to any component of the construction of spaces "turned over" to the Contractor.
   c. Damage to the electrical distribution system and/or other space "turned over" to the Contractor.
   d. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the Contractor or other actions of Contractor.

B. Other damage to the materials, tools and/or equipment of the Owner, its consultants, General Contractor, subcontractors, Architect, other Contractors, agents and lessees.

1.10 COORDINATION

A. Where connection between components or control features are accomplished over the Owner's LAN, Contractor shall coordinate with the Owners IT department for IP addresses, firewall access, and other issues pertaining to successful integration.

B. Cooperate and coordinate as required with other Contractors who are responsible for work not included in this section.

C. Provide all information as required or requested by the Owner, Architect, Consultant or General Contractor for the project to be completed to the satisfaction of the Owner.

D. Notify General Contractor in a timely manner of system design or installation conflicts, which affect the intended use, or performance of the system.

E. Attend job construction and progress meetings that the Owner, GC, or Architect deems necessary.

1.11 WARRANTY

A. The Contractor shall warrant and guarantee all work against defects in material, equipment or workmanship for one (1) year from the date of substantial completion of the entire project.
1. Contractor to provide pricing for additional manufacturer warranty services after the initial warranty expires.

B. Upon receipt of written notice, Contractor shall remedy defects within thirty (30) days, or the Owner shall correct the defects and the Contractor, or its surety shall be liable for expenses.

1.12 GENERAL REQUIREMENTS

A. This section covers the general requirements for the installation of the Integrated Audio-Video system by the Contractor.
1. The Contractor shall coordinate all final power requirements, conduits, and conduit sleeves prior to rough in installation.
2. In the installation of this work, the Contractor shall comply in every way with the requirements of Owner's standards, local and state laws and ordinances, the National Board of Fire Underwriters, and the National Electrical Code. If, in the opinion of the Contractor, there is any-

thing in the plans or specifications that will not strictly comply with the above laws, ordinances, and rules, the matter shall be referred to the attention of customer's representatives for a decision before proceeding with that part of the work. No change in the plans or in the Specifications shall be made without full consent in writing by the Owner's representative's engineer.

3. The Contractor shall obtain the customer's permission before proceeding with any work necessitating cutting into or through any part of building structures such as girders, beams, concrete or tile floors, partition ceilings.
4. The Contractor shall be responsible for and repair all damage to building due to carelessness of workers, and exercise reasonable care to avoid any damage to customer property. The Contractor will report to the customer representatives any damage to the building which may exist or may occur during the occupancy of the quarters.
5. Contractor shall provide components, wire, connectors, materials, parts, equipment and labor necessary for the complete installation of the system, in full accordance with the recommendations of the equipment manufacturers and the requirements, specifications and all applicable codes.
6. The Contractor shall be responsible for installation of proper grounding and bonding.
7. The Contractor shall take necessary steps to ensure that the required firefighting apparatus is accessible always. Flammable materials shall be kept in suitable places outside the building.
8. The Contractor shall install the materials in accordance with the manufacturer's specifications.
9. Equipment shall be held firmly in place with manufacturer's recommendation and/or EIA standard types of mounting hardware. All equipment shall be installed to provide reasonable safety for the operator.
10. The Contractor shall promptly correct all defects for which the Contractor is responsible.
11. The Contractor shall insure that all records and reports, City relations, engineering, metering, inspections, testing, quality or service standards and safety measures comply with standards applicable for the State where the work is being performed.
12. The Contractor shall coordinate all work with the customer's assignee or as will be designated at a future date.
13. The Contractor shall remove all excess material and debris and return to its original state of cleanliness. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap wire, etc., and dispose of such items daily.
14. Upon completion of installation and prior to acceptance, all equipment shall be thoroughly cleaned and made free from extraneous bits of soldier, wire, etc. by the Contractor. Contractor shall cleanup work area and remove ALL waste and trash. Debris resulting from the installation shall be removed from all areas and disposed of by the Contractor.
15. All work shall be done in a thorough and conscientious manner according to industry standards and shall be subject to inspection and acceptance.
16. The Contractor shall be certain that all installation work areas are secure and made safe in accordance with Occupational Safety and Health Administration (OSHA) regulations.
17. An appropriate installation schedule shall be developed by the Contractor and will be subject to approval by the customer's representatives. The construction schedule should include at least one installation supervisor, or lead technician, for on-site management of the project.
18. Prior to starting the installation, the assigned installation supervisor, or lead technician, shall participate in a walk-through of the project location with customer's engineers to review the installation documentation, verify that all construction necessary for the installation has been completed, and verify all installation methods and cable routes.

19. It shall be the responsibility of the installation Contractor to furnish any special installation equipment or tools necessary to properly complete the installation.
20. The Contractor shall not roll or store cable reels without an appropriate underlay.
21. The Contractor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.
22. The Contractor shall insure that the maximum pulling tensions of the specified distribution cables are not exceeded at any time during the placement facilities. Failure to follow the appropriate guidelines may require the Contractor to provide additional material and labor necessary to properly rectify the situation. This shall also apply to all damages sustained to the cables by the installation Contractor during the implementation.
23. Materials shall be consistent throughout the building. Where two or more units of the same class of equipment are required, these units shall be the product of a single manufacturer and shall be the same product with the same material, model, and manufacturer number.
24. The wiring, materials, and equipment furnished for this request shall be the standard product of the manufacturer.
25. All wiring, materials, and equipment must be listed and labeled by a nationally recognized testing laboratory.
26. All wiring, materials, and equipment must be suitable for the environment they are to be permanently installed in.
27. All equipment proposed by the Contractor must be new and unused. Equipment refers to all hardware, software, equipment, cabling, materials and incidentals etc.
28. Provide manufacturer's original box or shipping container from one (1) of every serialized.

1.13 QUALIFICATIONS

A. Manufacturer

1. Manufacturer will have a minimum of ten (10) years' experience in the manufacture of sound system products.
2. Maintain a 24-hour toll free telephone assistance line or online presence for customer and installer support.

B. Contractor

1. The Contractor shall be a business engaged primarily in Audio-Video integration.
2. The Contractor selected to provide the installation of this system will be certified by the manufacturing company in all aspects of design, installation and testing of the products described herein.
3. The Contractor will utilize the authorized manufacturer components in provisioning this Project.
4. Contractor will have a minimum of three (3) years of recent experience with the proposed manufacturers' products.
5. Contractor will have a minimum of five (5) years' experience with the design, installation, and project management of local sound systems.
6. Contractor will comply with all federal, state and local statutes regarding qualifications of firms.
7. The Contractor will be experienced in all aspects of this work and will be required to demonstrate direct experience of recent systems of similar type and size.
8. Contractor must provide On Site Supervision and Project Management by person(s) with a manufacturer certification.
9. The Contractor must have previously established offices located within 75 miles of the project location as the starting point.

10. The customer reserves the right to reject the bid of any bidder who has previously failed to perform properly, or complete on time, contracts of a similar nature.

1.14 BID

A. Contractor will be required to provide the following documents with the bid response.
1. Training certificates for design, engineering and installation of the proposed product types.
2. The contractor must show proof that Public Address System integration is the primary function of the company.
3. Contractor will provide a list of all current installations that will be ongoing during this project, and the manpower requirements for each of those installations.
4. The preferred Contractor will have a minimum of (3) three references. Contractors providing a reference with an invalid phone number will be considered as an incomplete response and may be disqualified.
5. Contractor will provide a sample of the warranty that would be provided to the customer when the installation is complete and documentation of the support procedure for warranty issues.
6. Contractor will submit a resume of qualification with the Contractor's bid proposal indicating the following:
    a. A technical resume of experience for the Contractor's Project Manager and on-site installation supervisor (Project Foreman) who will be assigned to this project. The project manager should have a minimum of 5 years' experience on projects of similar size and design. The Project Foreman will have a minimum of 3 years related project experience working crews of 4 or more personnel.
    b. A list of technical product training attended by the Contractor's personnel that will install the system.
    c. Any sub-Contractor who will assist this section Contractor in performance of this work, will have the same training and certification as the Contractor. The use of Subcontractors is not prohibited for this project.

PART 2- PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements provide product by the following manufactures specified within.
1. Bogen Communications

B. Source Limitations: Obtain public address system from single source from single manufacturer.

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 NFPA 70.Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Avitru. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

2.02 PRODUCT SPECIFICATIONS

A. Hardware: Contractor shall supply equipment, accessories, cables, and connectors necessary for system to operate according to stated functional requirements, whether said products are listed.

B. Software: Contractor shall utilize Manufacturer's official current version of configuration software.

C. Control Interfaces: Shall be labeled or configured with graphical user interface as appropriate.

D. Power Supplies: As required, Contractor shall provide necessary power supplies for amplifies requiring DC voltage to power Ethernet card when forced in standby mode.

E. Uninterruptible Power Supplies (UPS): Contractor shall provide a minimum of one UPS per Public Address System equipment rack for all pre-power amplifier equipment, whether specified or shown. Signal processing equipment and a minimal amount of audio amplifiers shall be connected to the UPS to allow for the Owner to announce emergency instructions of the Public Address System system if desired.

2.03 GENERAL

A. The model numbers used are those of Bogen Communications, Inc., Ramsey, New Jersey. This shall constitute the quality, compatibility, and performance of the equipment to be furnished; any other proposed intercom equipment manufactures devices must be pre-approved, no exceptions.

B. Unless otherwise provided in the specifications, reference to any equipment, material, article, or patented process, by trade name, make or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. If the respondent wished to make a substitution to the specifications, the respondent shall furnish to the Engineer the name of the manufacturer, the model number, and other identifying data and information necessary to aid the Engineer in evaluating the substitution, and such substitution shall be subject to the Engineer's approval. Substitutions shall be approved only if determined by the Engineer to be equivalent to that specified. A proposal containing a substitution is subject to disqualification if the customer’s representative does not approve the substitution. Quantities of products should be verified with drawings and any discrepancies reported to the Owner's representative in writing for resolution.

C. Unapproved product substitutions which have been provided and/or installed will be replaced with the specified products at Contractor’s sole expense.

D. Furnish all accessories items necessary to integrate each piece of equipment into the system including rack mounts and other mounting devices, special connectors and interfaces.

E. Coordinate with architect the finish of all exposed items to blend with adjacent architectural elements of the building.

F. Major components of the system such as DSP, power amplifiers, mixer-preamplifiers, and tuners, shall have a device, whether internal or external, which provides protection against voltage spikes and current surges originating from commercial power sources.

2.04 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Descriptions in this article are examples only; revise to indicate actual design intent.

B. Each classroom shall be equipped with a talkback intercom ceiling speaker with a station call number.

C. Each office and special use area (conference room, gym, cafeteria, library, etc.) shall be equipped with intercom ceiling speaker(s) with a station call number.

D. Common zone intercom speakers shall serve all corridors, passageways, and janitors’ closets.

E. Zone exterior speakers separately

F. All speakers: classroom, office, corridor, exterior, gymnasium, cafeteria, and common areas shall produce clear human voice reproduction at 10 dBA over fully occupied ambient noise levels minimum (i.e. corridors at class change) but never less than 65 dBA or more than 110 dBA throughout all normally occupiable areas

G. Provide as indicated on plans an Intercom Administrative Phone Desksets “PA” with digital readout to provide the following functions:

1. The digital readout displays shall identify incoming calls by their designated numbers. The display shall show visually, in the order received, three (3) calls at a time. Emergency calls shall override normal calls and shall annunciate with the letters "EMER" and the calling station number. There shall be an audible indication of incoming intercom calls. Emergency calls shall initiate a distinctive audible alert and be indicated on the display.
2. Provide facilities for answering calls registered in the display by pressing a single "response" button on an authorized administrative telephone.
3. Provide the capability to broadcast all-call or zoned intercom announcements and class change time tones over all interior, exterior, and corridor speakers. Zone exterior speakers separately.
4. The system shall provide facilities for calling a staff (classroom) station or making page announcements from any administrative system telephone.

H. The system shall provide facilities for calling a staff (classroom) station by dialing the station number. User programmable room station numbers for any combination of 2 to 4 numeric digits.

I. The central microprocessor control equipment shall be of modular design, expandable to 250 stations. All programming shall be alphanumerical menu driven. The system shall be equipped with self-diagnostics.

J. The system shall provide the capability of assigning speaker locations to any one or more of the eight (8) software programmable zones for zone paging or time signal reception.

K. Systems amplifiers shall be capable of providing sufficient power for emergency paging of all speakers with a 30 percent reserved capacity for future expansion.

L. System central control equipment shall be Underwriters Laboratory listed under Commercial Audio Systems and Accessories UL 813 and installed in a 19" rack cabinet and located where shown on the drawings or as directed by the Architect.

M. Provide an Uninterruptible Power Supply (UPS) with sufficient standby battery capacity to operate the intercom clock system without AC power for two hours of normal operation (no announcements) and thirty minutes of all-call announcement operation (full load) at the end of this period.

N. System Functions:
1. Selectively connect any zone to any available signal channel.
2. Selectively control sound from microphone outlets and other inputs.
3. "All-call" feature shall connect the all-call sound signal simultaneously to all zones regardless of zone or channel switch settings.
4. Telephone paging adapter shall allow paging by dialing an extension from any local telephone instrument and speaking into the telephone.
5. Produce a program-signal tone that is amplified and sounded over all speakers, overriding signals currently being distributed.
6. Reproduce high-quality sound that is free of noise and distortion at all loudspeakers at all times during equipment operation including standby mode with inputs off; output free of non-uniform coverage of amplified sound.
7. The time control system shall be capable of operating and correcting the clocks as well as controlling class change signals and/or bells.
8. The system shall provide for automatic clock correction for Daylight Savings Time. The system shall automatically adjust one hour ahead in the spring and one hour back in the fall on the correct day and at the correct time. Daylight savings shall not require the use of any user input at the time of daylight savings.
9. The clock shall be continuously synchronized with the Master controller; therefore, corrections are done instantaneously, and all clocks maintain identical time. In the event of a power

failure, the system maintains proper timekeeping during the outage. Once power is restored, all clocks are immediately updated with the correct time.

10. Electrical Contractor shall provide and install conduit pathway and back box. The Div. 27 0000 contractor shall provide the data cabling and outlet to the back of the device.
11. The Owner shall have the ability to program and schedule notifications.
12. The system shall have the ability to generate and distribute automated as well as Owner scheduled alerts and messages through mobile messaging, email and socials media.

2.05 SYSTEM DESCRIPTION

A. Compatibility of Components: Coordinate component features to form an integrated Public Address System. Match components and interconnections for optimum performance of specified functions.

B. Equipment: Comply with UL 813. Equipment shall be modular, using solid-state components, and fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

C. Equipment Mounting: Where rack, cabinet, or console mounting is indicated, equipment shall be designed to mount in a 483-mm housing complying with EIA/ECA-310-E.

D. Retain "Weather-Resistant Equipment" Paragraph below if some equipment will be located outdoors or if modifying this section to specify portable equipment which may be used outdoors.

E. Weather-Resistant Equipment: Listed and labeled by a qualified testing agency for duty outdoors or in damp locations.

2.06 AUDIO PROGRAM SOURCE

A. Provide a wall plate with a 3.5 audio input at the reception desk connected to the intercom headend.
   1. RDL D-CIJ3 or equivalent

2.07 TELEPHONE SYSTEM INTERFACE

A. The functions described below are accomplished through the connection of the intercom system subject to owner provided licensing and system enrolment of the Analog Telephone Adapter to the VoIP telephone system and to program a designated station number to allow each telephone to access this port. If the Owner elects not to enrollee the Analog Telephone Adapter to provide these capabilities, then provide a labeled intercom service jack at the intercom rack for future connection.

B. Provide one (1) SIP Analog Telephone Adapter (ATA) interface (ATA191-3PW-K9 Phone Adapter recommended). This interface shall provide transparent access from the building telephone system to the intercom DTMF analog port. The intercom system shall feature a distinctive dial tone and DTMF touch tone recognition to provide this transparent interface.

C. Any administrative system telephone shall be able to page on an all-call, and zone basis to any of the eight paging zones.

D. Any administrative system telephone shall be able to initiate an emergency announcement to all locations. Emergency announcements override all other programs.

E. Any administrative system telephone shall be able to initiate manual time tones to any combination of time zones.

F. Any administrative system telephone shall be able to initiate emergency evacuation and signal tones.

2.08 EMERGENCY SIGNAL TONE OPERATION

A. Provide facility through both rack mounted switches and dial-up operation through the telephone system interface the ability to distribute various emergency signal tones through all intercom speakers. Verify exact requirements with Owner. Provide the following functions each with a distinctive signal:
   1. Take Cover (Hazardous Weather Conditions) European siren or similar.
   2. Evacuate (Hazardous Condition within Building) stutter tone or similar.
   3. Security Alert (Suspicious Person on Campus, keep students in class and lock doors) chime or similar.

2.09 MASTER CLOCK SYSTEM

A. The master clock system shall include an easy-to-use web-based interface that allows for configuration via Internet UTC World Time Clock Synchronization.

B. The master clock system shall include an easy-to-use web-based interface that allows for configuration via the Internet or LAN/WAN. The editor shall allow staff to create and modify schedules, music on class change, holidays, page, program, and time zones, etc. Password protected user accounts may be assigned different access privilege levels that determine what can be modified on a system.

C. Internet UTC World Time Clock Synchronization: Provide World Time Clock Synchronization for the master clock system. Interface shall connect via a TCP/IP Internet network connection that provides time correction with any Internet atomic clock. Unit shall provide digital communication as needed to interface to the intercom system master clock. Rack mount unit shall include LED display to indicate status.

D. The system shall include a built-in Master Clock capable of performing the following functions:
   1. Provide a minimum of 255 discrete time event entries including the following:
      a. The time of day in hours and minutes.
      b. The day or any combination of (7) days of the week the event is to occur.
      c. Selection of any one or any combination of (8) zones or outputs to be activated.
      d. Selection of any one or any combination of (8) schedules to allow maximum flexibility due to special circumstances or seasonal changes.
   2. The Master Clock shall be able to simultaneously correct intercom system displays, digital, synchronous analog secondary clocks, and electronic video display clocks.
   3. In the event of a power failure, all programmed data shall be retained in non-volatile memory. Time keeping shall be held by an internal lithium battery providing a 5-year back-up so that there is no need to re-enter the time or date after the power has been restored. The clock shall provide an accurate, dependable time base. Upon restoration of power, the system will automatically correct secondary clocks.
   4. Output points, activated by the Master Clock, shall be provided in the system for controlling external sounds and other devices.
   5. Direct, Select, Editing, and Review routines shall be provided to permit the user to change and edit time, events, zones, and schedules without having to reprogram the entire sequence.
   6. The system shall be configured to allow mechanical bells and loudspeaker class change tones to operate simultaneously within the same system.

2.10 INTERCOM SYSTEM HEADEND EQUIPMENT

A. Mount all equipment, except portable equipment, firmly in place. Permanently mark all cables and install in a professional, neat, and orderly installation. All wiring and cables will be securely fastened and routed using wire ties. Provide for adequate ventilation in all equipment racks and take precautions to prevent electromagnetic or electrostatic hum. Insert test results in the owner's manual.

B. Master Control Unit: Microprocessor based unit with solid-state switching circuits, program control and clock controls. The master clock shall be microprocessor based and programmable via a 16 pad waterproof, 20-character X 2 row LCD display, and 0.56 inch LED display. The master clock shall include frequency stability of 5 ppm and aging of 5 ppm per year. The master clock shall have a frequency tuning circuit to allow for time base corrections with changes in temperature. The master clock shall also provide field enable/disable daylight savings time. The programmable master clock shall be capable of storing, in a non-volatile memory, and controlling up to 800 events (3,000 as option), each set with precise second resolution. Special programs shall be readily programmed for up to 255 different schedules and holidays, and 50 scheduling changes can be set in advance. The master clock shall be capable of controlling two different clock systems simultaneously, in addition to RS485 input and output and two wire output for controlling Bogen RS485 and Bogen digital communication analog clocks. The master clock shall have a ten-year battery backup for timekeeping, an RS232 computer interface port, and an input port to interface with other systems and WWVB/GPS interface capability.

C. Network Switch
1. All intercom cabling to be terminated in one rack in the MDF.
2. Acceptable Manufacturer: DLINK
3. Acceptable Model: DGS-1100-24P

D. Nyquist NQ-E7030 Analog Station Bridge
1. 24 station support
2. 120W of total available power; max. 40W per any individual port
3. 25 Volt Speakers(s)
4. Analog Call Switch(s)
5. Software programmable configuration and operation.
6. Rack mounted, wall mounted, or shelf mounted
7. CAN Bus 2.0 interface for future support for NQ-E7020 DCS

E. Nyquist NQ-P0100 Matrix Mixer Pre-amplifier
1. No less than four Line/Microphone Level Inputs used for:
    a. CD Player
    b. AM/FM Tuner
    c. Push-to-Talk Paging Microphone
    d. MP3 Player
    e. Digital AES/EBU (AES3) input
2. Line Level output to drive external amplifier
3. Software programmable configuration and operation
    a. Push-to-Talk Channel
    b. Push-to-Talk Type
    c. Push-to-Talk Zone
    d. Mixer Channels
4. Mixer Channels Wall or shelf mounted

F. Nyquist NQ-E7010 Input/Output Controller
1. Eight Dry Contact Inputs
2. Eight Open Collector Outputs
3. Software programmable configuration and operation including:
4. Contact Type
5. Extension
6. Name
7. Close Interval

8. Actions including:
    a. Audio
    b. Alarm
    c. Announcement
    d. Disable-Audio
    e. Other
    f. Tone
    g. Enable-Audio
9. Action ID
10. Zones
11. Close Extension
12. Dashboard Type
13. Dashboard Title
14. Dashboard Scope
15. Dashboard Text
16. Dashboard Style
17. Email
18. Wall or shelf mounted

G. Nyquist Station Equipment
1. NQ-T1100 VoIP Admin Phone – Color Touch Display (aka Admin Station)
2. NQ-T1000 VoIP Staff Phone – LCD Display (aka Staff Station)
3. NQ-S1810WT VoIP Wall Baffle Speakers with talkback
4. NQ-S1810CT VoIP Ceiling Speakers with talkback
5. NQ-E7020 Digital Call Switch
6. CSD2X2U Drop-In Ceiling Speaker
7. CA15C or CA21B Analog Call Switch

H. Optional Equipment
1. Telephony interface device(s) for FXO/FXS analog port connectivity

2.11 COMPONENTS AND DESCRIPTIONS

A. The Nyquist E7000 Series Educational System is a software-based VoIP paging and intercom system.

B. The VoIP capabilities of the Nyquist system will enable the support of the features across the various Nyquist appliances within the facility. The following sections define how the system handles each of the features in the system. Systems that do not allow appliances to be seamlessly integrated via the LAN are not considered equal.

C. Nyquist E7000 Server Software
1. The Nyquist E7000 server software shall be installed on a dedicated dealer or customer supplied server. An unlimited number of facilities can be networked into a Nyquist-based District.
    a. Minimum Nyquist Server Requirements
        1) Debian Linux OS (AMD 64-bit version) release 8.4.x – 8.8.0
        2) Quad-core Intel-based processor running at 3.0 GHz or higher
        3) 8 GB RAM
        4) One 250 GB disk drive
        5) Redundant Array of Independent Disks (RAID) is recommended for redundancy and high availability.
        6) NIC 10/100/1000 MB Ethernet port

7) One or more PCI/PCI Express (PCIe) slots if telephony network connectivity other than, or in addition to, SIP trunking.
8) One or more PCI/PCIe type third-party telephony interface cards (for example, FXO, FXS, etc.) if telephony network connectivity other than, or in addition to, SIP trunking.

2. Audio shall be transmitted between the server and the Nyquist appliances using the customer supplied LAN/WAN using both G.722 and Opus 48k audio encoding and streaming technology to deliver High Definition audio quality. Systems that do not use G.722 and Opus for audio encoding and streaming shall not be deemed equivalent.
3. The Nyquist server software and Nyquist appliances software shall be upgradeable via the Nyquist Web UI.
4. It shall be possible for a Nyquist facility to make “station-to-station” calls and “remote facility” All-Call pages to a single facility or to all Nyquist facilities in a district via the Nyquist Web UI or an Admin Station. Systems that require remote viewing software or other application software to be installed/loaded on to additional servers or PCs to make station-to-station calls and remote facility All-Call or district paging shall not be considered equivalent.
5. The Nyquist server software is designed to handle all facility and district-wide communications, including but not limited to, inter-facility intercom calling and paging, district-wide Emergency All-Call and local facility point-to-point calls. Via the Nyquist Web UI, every facility shall be configured with the IP addresses of all the other remote facilities within the district.
6. Nyquist can support an unlimited number of facilities; however, the maximum number of simultaneous remote facility intercom calls supported is based on the actual performance of the WAN and the Nyquist Server CPU load.
7. The voice quality of the facility calls may vary based on the WAN conditions. The maximum network bandwidth that All-Call and Zone Paging uses is 64 kbps (Multicast G.722), and intercom calls use 128 kbps (unicast, G.722).
8. The system shall facilitate the repetitive playing of Normal or Emergency audio tones or announcements directed to a Paging Zone until stopped by the Nyquist user via the Web UI, an Admin Station, or a dry contact closure connected to the Nyquist I/O Controller NQ-E7010.
9. A built-in Master Clock shall be included to automatically control class change bells or other time-based signals. The Master Clock shall have an unlimited number of Events that may be programmed into any of the unlimited number of Schedules, and unlimited number of Holidays. The schedules shall be nameable for easy selection when assigning schedules to days or overriding a schedule.
10. Network Time Synchronization. The system shall be capable of periodically updating/synchronizing the processor’s time with a Network Time Server running Network Time Protocol (NTP) via the school’s LAN network. Systems that do not provide Network Time Synchronization will not be deemed equivalent. The Nyquist server can be the NTP server for other devices on the LAN such as IP clocks and other IP devices.

D. Nyquist Server Application

1. The Nyquist software is installed onto the server, and upon boot-up, users can log in to the Nyquist server application via a web browser that supports WebRTC. Systems that require Com Port redirect software, client PC application, software or serial-to-Ethernet adapters for user access are not deemed equal. Communications between the server and the Web UI(s) shall be via secure Hyper Text Transfer Protocol (HTTPS) connections (i.e., https://).
2. The Nyquist Web UI shall be configured with four different default user access levels, based on four unique user roles. Systems that do not provide unlimited access levels and unlimited user roles are not considered equal.
3. The four default roles shall be: admin, optech, operator, and user. These roles provide a starting point/example for administrators to create additional roles.

4. Only a user assigned the admin role shall be able to provide access to users, giving them the ability to create, delete, edit, and view system parameters.
5. Only an Administrator shall have the ability to adjust roles and Class of Service (CoS) of users. The roles determine if users can view the definable data objects that can include configuration, alarms, and performance data and if users can perform certain operations based on the user's role and station's CoS. All changes to roles and CoS are effective immediately, without the need to restart the browser or reboot the server.
6. The Nyquist Web UI Dashboard shall provide full administrative capabilities to manage/operate the following system features:
    a. Calling/Paging – User can initiate a call by accessing the directory or by dial pad and can receive calls, make Zone Page and All-Call Page, make a Prepending Page, Emergency All-Call paging.
    b. Call Forwarding
    c. District Calling/Paging – Used for District Facility Page, District All-Call, and District Emergency All-Call.
    d. Tones/Announcements – Used to play Tones, Announcements, and Alarms.
    e. View This Week's Schedule – Used to show the current interactive Bell Schedule.
    f. Audio Distribution – Used for entire facility or Audio Zones
    g. Enable or Disable Audio – Used to place the Nyquist system into Page Exclusion mode (i.e., "mute" the system) when a contact closure is supplied from the fire alarm panel. Systems that do not provide this capability are deemed not equal.
        1) Systems that require application software to be installed on a PC to manage the above features shall not be considered equivalent.
7. To facilitate installation and configuration of the system, additional Web UI menus are required. The menus shall only be visible to users with the correct roles and CoS. The navigation menus found on the Web UI shall be as follows:
    a. System Parameters – Allow installers to adjust core system parameters.
    b. Zones – Allow installers to create and modify Paging, Time, and Audio Zones.
    c. Schedules – Allow installers and administrators to create bell schedules for the facility, predefine alternative schedules to run, prevent the bells from ringing on a holiday, and schedule an announcement to play. The system shall allow an unlimited number of schedules to operate simultaneously within a facility.
    d. Admin Groups – Allow the installer to create, modify, and delete software groupings of admin phones that can ring when a station calls in with a call switch.
    e. CoS Configuration – Allow the installer to create, modify, and delete CoS groups that control station access to the following features: Call-in Level, Zone Paging, All-Call Paging, Emergency All-Call, Inter-Facility Call/Page, Audio Distribution, Remote Pickup, Join Conversation, Call Forwarding, Walking Class of Service, External Call Routing, Call Transfer/3-way Calling, Manually Activate Tone Signals, Call Any Station, Manage Recording, Monitor Calls, Monitor Locations, Conference Admin, Conference User, Voicemail, Record Calls, Activate Alarm Signals, Disable Audio, Enable Audio, Allow Callee Auto-answer, District Paging, and Inter-Facility Features.
    f. Stations – Allow the installer to set up, modify, and delete stations; set up Page Exclusion; view Station Status; and add New Stations.
    g. Bridge Devices – Allow the installer to configure the Nyquist ASBs.
    h. Audio – Allow the installer to upload and manage Announcements, Playlists, Songs, and Tones. The system must support the uploading of both MP3 and WAV files and make Audio file management simple for users. Systems that limit the size of Audio files shall not be considered equal.

i. Users – Allow the installer to manage users by giving them the proper roles and assign extensions if needed.
j. Roles – Allow the installer to grant users rights to Create, Delete, Edit, Restart Server, Sort Menu, Systems Update, Manage, Import/Export, Restore, Settings, or View.
k. Facilities – Allow the installer to set up the district wide facilities for remote paging and calling.
l. Outside Lines – Allow the installer to set up FXS and FXO ports for inbound and outbound system calling.
m. SIP Trunks – Allow the installer to set up SIP trunks into the facility for inbound or outbound calling.
n. Call Details – Allow the installer to review the historical system activities that can be used for incident investigation or system troubleshooting.
o. System Backup/Restore – Allow the installer to preform system backups or restores and allow the backups to be scheduled to run automatically.
p. System Logs – Allow the installer to view and export Server, Nyquist-Intercom, and Web Server logs that can be used for troubleshooting and technical assistance.
q. Paging Exclusions – Allow the installer to view and edit stations that are excluded from paging.
r. Firmware – Update firmware for Nyquist speakers and appliances.
s. Help – Provide information about the system, online help topics, and System Administrator Manual.
t. Systems that do not provide these menus as a minimum shall not be considered equal.

E. Nyquist NQ-E7030 Analog Station Bridge

1. The Nyquist NQ-E7030 ASB allows facilities with existing Multicom or Quantum or compatible intercom systems to upgrade to Nyquist. Each ASB supports up to 24 speakers and call switches with 120 Watts of embedded 25 Volt power. The ASB is designed to drive any combination of 25 Volt speakers and horns. Features Include:
    a. 10/100 Ethernet
    b. 24 station interface - Supports connections to as many as 24 individual 25 Volt speakers with one 25 Volt speaker connection per interface
    c. 24 dry contact closure-type analog Call Switch connections
    d. Half-duplex talkback using speaker as pickup
    e. CAN Bus 2.0 Interface for future NQ-E7020 DCS support and other accessory devices.
    f. 120W of available power across all 24 channels; maximum 40W per channel
    g. 2 x RGB full spectrum LED status indicators
    h. USB 2.0 host port, type A connector (future use)
    i. Universal mains supply (100VAC – 240VAC)
2. The Nyquist NQ-E7030 ASB shall be rack, wall, or shelf mountable and shall include the required mounting bracket hardware.

F. Nyquist NQ-P0100 Matrix Mixer Pre-Amplifier (MMPA)

1. The Nyquist NQ-P0100 MMPA is designed to bring external audio into the Nyquist system. The MMPA interfaces with a local sound system by accepting one or more local audio sources, mixing them, and outputting them to either, a) the network for Audio Distribution, or b) the MMPA's line level output that can then be inserted into an external amplifier to drive local sound system in gyms, cafeterias, auditoriums, etc. The MMPA supports the following:

a. Four software selectable MIC or Line Input channels via three XLR connectors and four sets of screw-terminals. Any single input channel shall be capable of being configured to support a Push-to-Talk microphone (for example, Bogen DDU-250). Channel-1 can be configured as a digital AES/EBU (AES3) input. Line/Monitor output – The MMPA becomes a station on the Nyquist system, allowing users to call it directly or to include it in any of the Page, Time, or Audio Zones.
b. The MMPA shall support the following features: Line-Level output to drive input on a local amplifier; One USB 2.0 host port (Type-A connector) for future use; 2 x RGB full spectrum LED status indicators.
c. The MMPA is powered by Universal mains supply (100VAC – 240VAC).
d. The MMPA shall be wall or shelf mountable and shall include the required mounting bracket hardware.

2. The dealer shall supply a minimum of one Nyquist MMPA that allows for up to four user-configurable audio inputs. The MMPA shall support Line, MIC, and digital AES/EBU (AES3) input sources. The system shall support an unlimited number of MMPAs.

G. Nyquist NQ-E7010 Input/Output Controller

1. The Nyquist NQ-E7010 I/O Controller is designed to accept contact closure inputs and activate open-collector outputs to drive relay coils.
   a. PoE Class-1; IEEE 802.3af compliant with Optional 48VDC 15W power supply
   b. Eight Dry Contact Closure Inputs that can be used with Fire Alarm Override Relays, external event triggers (for example, Lockdown Buttons, etc.)
   c. Eight Relay Driver Outputs (Open-Collector) for use with Clock Correction (Sync Pulse), response to contact closure inputs, etc.
   d. USB 2.0 host port, Type-A connector (future use)
   e. 2 x RGB full spectrum LED status indicators
2. The Nyquist NQ-E7010 I/O Controller shall support wall or shelf-mounting options and shall include the required mounting bracket hardware.
3. The Nyquist NQ-E7010 I/O Controller shall be designed for wall or shelf mounting.

H. Nyquist VoIP Admin Phone – Color Touch Display (Admin Station)

1. The Nyquist Admin Station shall have the following features:
   a. 7” 800 x 480-pixel color display with backlight
   b. Touch screen display for one touch operation
   c. Full-duplex hands-free speakerphone with AEC
   d. Call hold, mute
   e. Redial, call return, auto answer
   f. PoE (802.3af) Class-3 support
   g. Headset with EHS support
   h. Dual Gigabit Ethernet ports
   i. Desk Mountable
   j. Optional Wall mount capable
2. The Nyquist Admin Station display panel shall show the time of day and day of week, the current bell schedule(s), and the station numbers and call-in priority of staff stations that are calling in. Depending upon the system programming, an Admin Station shall display menus to activate Zone Paging, All-Call Paging, Emergency All-Call Paging, District All-Call paging, alarm signals, and external functions.
3. The Admin Station shall be capable of calling either the loudspeaker or Staff Station at each classroom location.
   a. The Admin Station shall display the classroom number of any station that calls 911. This allows front-office administrators to direct emergency personnel to the correct

physical location in the building when they arrive. If a system is not connected to outside phone lines, then 911 calls can be routed to a designated station within the facility. The system shall automatically record all 911 calls made from any station. The 911 call recording shall begin as soon as 911 is dialed and continue unit the call is terminated. Recorded calls shall be maintained on the system for later playback review and/or retrieval by authorized personnel and/or authorities. Systems that do not provide this feature will not be deemed equal.

I. Nyquist NQ-T1000 Staff VoIP Phone – LCD Display (Staff Station)
   1. Nyquist Staff Station shall have the following features:
      a. 132 x 64-pixel graphical LCD with backlight
      b. Two-port 10/100M Ethernet Switch
      c. Full-duplex hands-free speakerphone with AEC
      d. Call hold, mute
      e. Redial, call return, auto answer
      f. PoE (802.3af) Class-3 support
      g. Dual-color (red or green) illuminated LEDs for line status information
      h. Two 10/100M Ethernet ports
      i. Wall or desk mountable
   2. The classroom Staff Station shall be capable of the following features depending on how the station CoS is configured:
      a. Emergency intercom call – Staff Stations shall be capable of making an Emergency intercom call, which is then routed to the assigned Admin Station. This requires the display of the architectural number and call in level on the Admin Station. Systems that do not provide this feature are not equivalent.
      b. Speed dial
      c. Toggle audio distribution on and off
      d. Call Forward activation and deactivation for All-Calls/Busy/No Answer/Busy or No Answer.
      e. Conference Calling
      f. Transfer Call
      g. Dial Administrative station– Staff Stations can allow the user to dial the station number to call to the Admin phone or its associated speaker. The call shall be routed to the Admin Station showing the architectural number that is calling.
      h. Emergency All-Call – An emergency page shall be broadcasted to all the stations in the facility.
      i. Place Outside Call
      j. Remote Answer
      k. Single-Zone/All-Station Page
      l. Call Waiting Tone for Outside Calls – It shall be possible to feed the call waiting tone to the Administrative Phone during a conversation.
      m. Transfer call from VoIP speaker in classroom down to an associated Staff Station
      n. Transfer call from analog speaker in classroom down to an associated Staff Station
      o. Transfer call from VoIP Staff Station in classroom up to an associated VoIP speaker
      p. Transfer call from Staff Station in classroom up to an associated analog speaker

J. Nyquist NQ-E7020 Digital Call Switch
   1. The Nyquist DCS has been exclusively designed for use with Nyquist appliances equipped with a CAN Bus 2.0 Interface. The CAN Bus 2.0 interface provides power and signal, and multiple DCSs can connect to each CAN Bus 2.0 interface. The DCS fits into a Single Gang/ Low Voltage installation using standard ‘decora-plate’ covers (supplied).

2. The DCS is a capacitive touch button design, so it does not have any moving parts to wear out. The behavior of this switch is software definable. Systems that require membrane or mechanical rocker style call switches that can wear out over time shall not be acceptable.
3. Normal call initiation involves touching the DCS one time. When a user touches the button on the DCS once, one of the three LED segments will light up green, a normal call will be placed, and the light will start blinking green. This is the indication that the Normal call has been placed to the VoIP Admin Phone or to a group of VoIP Admin Phones and that the phone or phones are ringing.
4. Urgent call initiation involves touching the DCS one time. When a user touches the button on the DCS once, one of the three LED segments will light up yellow, an Urgent call will be placed, and the light will start blinking yellow. This is the indication that the Urgent call has been placed to the VoIP Admin Phone or to a group of VoIP Admin Phones.
5. Emergency call initiation involves touching the DCS one or three times depending on station programming. When a user touches the button on the DCS once or three times within three seconds, all three LED segments will light up red, an Emergency call will be placed, and the light will start blinking red. This is the indication that the Emergency call has been placed to the VoIP Admin Phone or to a group of VoIP Admin Phones.
6. Single Press Emergency Call, if programmed, involves touching the DCS one time. When a user touches the button once, all three LED segments will light up red on the DCS, an Emergency call will be placed, and the light will start blinking red. This is the indication that the Emergency call has been placed to the VoIP Admin Phone or to a group of VoIP Admin Phones.
7. Normal and Urgent calls can easily be upgraded to an Emergency call after the DCS is flashing by touching the button on the DCS one time. The Normal or Urgent call will be canceled, and an Emergency call will be placed.
8. Privacy Mode – Pressing and holding the button on the DCS for four seconds will place the speaker into Privacy Mode. As the user continually touches the DCS button, all LED segments will turn purple; when all three LED segments are lit purple, the speaker is in Privacy Mode. If a call comes into the classroom when the station is in Privacy Mode, the microphone will be disabled; the user in the classroom can touch the DCS once and it will allow talkback. Once the call ends, the classroom will need to manually return the speaker into Privacy Mode, if desired. The user can disable Privacy Mode without placing a call by pressing and holding the button on the DCS for four seconds. As the user continually touches the DCS, all LED segments will turn blue. When all three LED segments are lit blue, the speaker is no longer in Privacy Mode. Systems that require mechanical or membrane switches to achieve Privacy Mode shall not be considered equal.
9. The colors specified above are created by three RGB full spectrum LED segments to provide installers and users with visual status and feedback when installing and using the DCS. When the DCS is being installed and the power is connected before the signal, the LED will light red. It will also light red if the speaker in the classroom stops communicating with the Nyquist Server, indicating a problem with the station.
10. In addition to providing visual call status indications, a call confirmation audio file shall be played on the associated loudspeaker when a call is placed via a DCS. The three call-in levels shall have distinct audio confirmation messages:
    a. Call Placed
    b. Urgent Call Placed
    c. Emergency Call Placed
11. Emergency Link Transfer – If an Emergency call is unanswered by the VoIP Admin Phone and the Emergency Link Transfer is active, the Emergency call will be forwarded to the loudspeaker associated with the Emergency Link Station. Any station equipped with a

loudspeaker can be programmed as the Emergency Link Station. Systems that do not provide Emergency Link Transfer shall not be considered equal.

K. Additional Loudspeakers for use with the Nyquist ASB
   1. Classroom Speakers shall be Bogen:
      a. Ceiling Mounted Speakers: CSD1x2U Drop-In Ceiling Speaker
      b. Ceiling Mounted Speakers: S810T725PG8U Ceiling Speaker
      c. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker
   2. Hallway Speakers shall be Bogen:
      a. Ceiling Mounted Speakers: CSD1x2U Drop-In Ceiling Speaker
      b. Ceiling Mounted Speakers: S810T725PG8U Ceiling Speaker
      c. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker
   3. Outdoor/Gym/Locker Room Speakers shall be Bogen:
      a. FMH15T mounted in BBSM6 surface-mounted vandal-resistant enclosure/BBFM6
      b. flush-mounted vandal-resistant enclosure with FMHAR8 adapter ring and SGHD8 heavy duty grille
      c. KFLDS30T Wide Dispersion Re-entrant Horn Loudspeakers

L. Clock System
   1. Master Clock
      a. Bogen BCMA-2RO-0000-1
   2. 12” Corridor/Office Clocks
      a. BCAM-4BS-12R-4
   3. 16” Gym/Hub Clocks
      a. BCAM-4BS-16R-4
   4. Cafeteria Clock – 4” Digital
      a. BCBD-31S-404-R

2.12 PREAMPLIFIERS

A. Retain one of two "Preamplifier" paragraphs below.

B. Preamplifier: Separately mounted.

C. Preamplifier: Integral to power amplifier.

D. Output Power: Plus 4 dB above 1 mW at matched power-amplifier load.

E. Total Harmonic Distortion: Less than 1 percent.

F. Frequency Response: Within plus or minus 2 dB from 20 to 20,000 Hz.

G. Input Jacks: Minimum of three. One matched for low-impedance microphone; one USB port; and the other matchable to DVD or CD player, or radio tuner signals without external adapters.

H. Minimum Noise Level: Minus 55 dB below rated output.

I. Controls: On-off, input levels, and master gain.

2.13 BATTERY BACKUP POWER UNIT

A. Unit shall be rack mounted, consisting of time-delay relay, sealed lead-calcium battery, battery charger, on-off switch, "normal" and "emergency" indicating lights, and adequate capacity to supply maximum equipment power requirements for one hour of continuous full operation.

B. Unit shall supply public address equipment with 12- to 15-V dc power automatically during an outage of normal 120-V ac power.

C. Battery shall be on float charge when not supplying system and able to transfer automatically to supply system after three to five seconds of continuous outage of normal power, as sensed by time-delay relay.

D. Unit shall automatically retransfer system to normal supply when normal power has been reestablished for three to five seconds continuously.

E. Provide and install Cyber Power PR2200LCDRT2U.

PART 3- EXECUTION

3.01 INSTALLATION AND PROGRAMMING

A. General Installation Expectations:

1. All work shall be done in a thorough and conscientious manner according to industry standards and shall be subject to inspection and acceptance.
2. The Contractor shall be certain that all installation work areas are secure and made safe in accordance with Occupational Safety and Health Administration (OSHA) regulations.
3. An appropriate construction schedule shall be developed by the Contractor and will be subject to approval by the customer's representatives. The construction schedule should include at least one installation supervisor, or lead technician, for on-site management of the project.
4. Prior to starting the installation, the assigned installation supervisor, or lead technician, shall participate in a "walk-through" of the project location with the customer's representatives to review the installation documentation, verify that all construction necessary for the installation has been completed, and verify all installation methods and cable routes.
5. The Contractor shall be responsible for completing a standardized report form addressing the weekly progress of the installation schedule.
6. The Contractor shall maintain conductor polarity identification at the main equipment room, backbone, and horizontal connections in accordance with industry practices.
7. The Contractor shall provide any necessary screws, anchors, clamps, tie wraps, distribution rings, power supplies, miscellaneous grounding and support hardware, etc., necessary to facilitate the installation of the system.
8. The Contractor shall be responsible for installation of proper grounding and bonding.
9. The Contractor shall be responsible for labeling all cable, distribution frames, and outlet locations, according to industry standards.
10. It shall be the responsibility of the installation Contractor to furnish any special installation equipment or tools necessary to properly complete the installation.
11. The Contractor shall not roll or store cable reels without an appropriate underlay.
12. The Contractor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.
13. The Contractor shall insure that the maximum pulling tensions of the specified distribution cables are not exceeded at any time during the placement facilities. Failure to follow the appropriate guidelines may require the Contractor to provide additional material and labor necessary to properly rectify the situation. This shall also apply to any and all damages sustained to the cables by the installation Contractor during the implementation.
14. The Contractor shall plug conduits where cabling has been installed by the installation Contractor in the equipment rooms, backbone and other cable entrance locations with re-enterable duct seal of flame-retardant putty.
15. Materials shall be consistent throughout the building. Where two or more units of the same class of equipment are required, these units shall be the product of a single manufacturer and shall be the same product with the same material, model, and manufacturer number.

16. Wiring, materials, and equipment will be delivered and stored in a clean dry space. They will be properly packaged in factory fabricated type containers and protected from damaging fumes, construction debris and traffic until job completion.
17. The wiring, materials, and equipment furnished for this request shall be the standard product of the manufacturer.
18. All installation techniques and fixtures shall result in ease of maintenance and ready access to all components for testing measurements. All external screws, nuts, and locking washers shall be stainless steel. No self-tapping screws shall be used unless specifically approved by the customer's representatives. All parts shall be made of corrosion resistant material, such as plastic, anodized aluminum or brass. All materials used in installation shall be resistant to fungus growth and moisture deterioration. An inert dielectric material shall separate dissimilar metals apt to corrode through electrolysis under the environmental operating conditions specified.
19. The Contractor will submit for approval, a detailed description of the procedures and equipment included for the complete operational installation.

B. Control Systems
1. Contractor shall meet with owner and whomever the Owner deems appropriate to discuss control features and navigation. Once agreement is received on the control navigation, the Contractor shall submit detailed documentation and GUI configuration and programming for approval. This process will continue until Contractor obtains documented approval from the Owner for control design. Contractor shall provide reasonable hours for changes once the system is operational to ensure the Owner's satisfaction. The control software shall be delivered to the Owner upon substantial completion of the project.

C. Wiring Plan Requirements
1. Distribution of the cabling will be accomplished through cable trays, conduit raceways, ducts, core-holes, extended columns, false half columns and plenums. Cabling shall be run at right angles from cable trays. Horizontal cable segments will be placed in cable trays and with cable exits/entrances supported by distribution rings or J Hooks. Cable may not rest on ceiling tile, be supported on existing ducting, tied, or supported by fire alarm, security or electrical infrastructure nor interlaced with existing cable.
2. The Contractor shall be responsible for providing an approved ground at all equipment locations. The Contractor shall also be responsible for ensuring ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes, and frameworks. All grounds shall consist of a minimum of 12 AWG copper wire or larger as required by code and shall be supplied from an approved building ground and bonded to the main electrical ground.
3. Observe proper circuit and loudspeaker wiring polarity. Properly and clearly label connections and wires as to function and polarity. No cables will be wired with polarity reversal between connectors, at either end. Take care when wiring microphone cables to ensure that constant polarity is maintained.
4. Contractor is responsible for coordinating final cable pathways and necessary conduit sleeves.

D. Cable Management
1. Maintain segregation of cables. AC power cables or speaker cables should not be run parallel within proximity to signal wires (within 2"), unless the wires are twisted.
2. The bend radius for twisted-pair cables is standardized at 12" (3" diameter).
3. Bundle cables within the guidelines of 2005 National Electrical Code (NEC) in Article 310.15(B)(2).

E. Rack Dressing
1. All Racks require Lacer Bars or Strips to provide clean cable management withing the rack.

2. All racks require the cable segregation of AC cables, Speaker Cables, low impedance balanced cabling and twisted pair cables.
3. All AV Racks should be assembled and tested at the Contractor's facility and transported to the job site when possible.
4. No Cable Ties; Velcro only.

F. Equipment Power Requirements:
1. Contractor is responsible for coordinating all final power requirements and locations prior to rough installation.

G. Identification, Labeling and Documentation
1. The Contractor shall label all termination devices, panels, enclosures, and equipment rooms. The Contractor will mark each unit with permanently attached, self-laminating markings that will not impair the equipment or present a hazard to maintenance personnel.
2. Place wire identification numbers on each end of all conductors. Install markers to be readable from left to right or top to bottom. Wire numbers shall be computer printed and self-laminating. Handwritten labels are not acceptable.
3. Mark all spare conductors and coil neatly located at the bottom of the equipment rack.
4. The contractor shall label power cables near the plug end. Label shall match equipment permanent label or function.

3.02 TESTING REQUIREMENTS

A. The Contractor shall perform sample tests in the presence of the customer's representatives. Performing the testing procedures specified herein assures that the equipment and interconnection meets the performance characteristics specified. If testing indicates that the performance characteristics are not met, the test shall be declared a failure. The communication equipment and interconnection cabling shall be modified and/or repaired accordingly. The failed test and any other test that may be affected by the modification and/or repair shall be rerun. After all components have been installed, the integrity of the equipment and interconnection cabling shall be verified.

B. If a system test fails because of any component(s) in the system, the failed component(s) shall be corrected or substituted with other components and the tests shall be repeated. If a component has been modified because of the system test failure, a report shall be prepared and delivered to Customer's Representatives prior to retesting. The Contractor shall prepare and submit all test procedures and data forms for the post installation and system test to the customer's representatives.

C. The test report shall contain the description of all tests performed, the results obtained, and any required adjustments or modifications necessary because of testing and installation. This report shall reflect the as-built communication equipment and interconnection cabling. An authorized representative of the Contractor shall sign the test report. At least three copies of the test report shall be sent to the customer's representatives.
1. Sample Test Report:

ITEM	ROOM/AREA	INPUT / OUTPUT	SOURCE	TEST RESULT	RECOMMENDED CORRECTIVE ACTION
1	Cafeteria Stage	AV-01 HDMI IN	Tech Laptop	No image displayed.	Verify HDBaseT connectivity on 12/25/19.

D. The test procedures shall have the Owner's representative's approval before the tests.

E. Contractor shall demonstrate to the Owner's representatives that the equipment operates as specified and that the tests meet performance requirements.

F. The Contractor shall ensure that the equipment is in first-class working condition and free of short circuits, ground loops, parasitic oscillations, excessive hum, RF interference, or instability of any form.

G. The Contractor shall test each operational component and adjust for equal sound levels at a given volume setting and replace defective items.

H. Contractor shall ensure that all loudspeaker and distributed audio systems described herein are balanced and optimized for maximum quality sound and coverage of listening areas.

3.03 TRAINING

A. Owner and End User training shall be video taped and provided to the Owner as project closeout documentation.

B. System training shall be provided for the operator/user and technical staff in separate training meetings.
   1. Operator/user training shall be held at Owner's convenience and to the Owner's satisfaction.
   2. Technical operation and maintenance training shall be held at Owner's convenience and to the Owner's satisfaction.
   3. The Contractor shall provide documentation demonstrating the Owner and/or Owner's Representatives understand the operation and maintenance of the system.

C. Complete operation and maintenance manuals and preliminary as-built drawings shall be delivered to the Owner one week prior to training sessions.

D. Operator/user training shall minimally consist of :
   1. Provide printed reference material for each trainee that documents and explains in layman's terms:
      a. System block diagram
      b. Normal day-to-day operation
      c. Operator selectable features
   2. Provide a hands-on training with Q & A session.

E. Technical Operations and Maintenance training shall consist of :
   1. The technical explanation shall be sufficiently thorough that staff personnel shall be able to make any programming changes required, analyze malfunctions and make equipment substitutions or bypasses necessary to maintain system operation except for the malfunctioning equipment or circuits.
   2. Provide printed reference material for each trainee that documents and explains in technical terms:
      a. System block diagram with technical features
      b. Technical operation, adjustments and programming
      c. System features and programming
      d. Review of as-built drawings.
   3. `Provide a hands-on training with Q & A session.

F. Contractor will provide a complete and comprehensive list of the maintenance schedule for all installed and/or provided equipment. The list shall be provided in both printed and Adobe Acrobat formats.

3.04 ACCEPTANCE OF SYSTEMS

A. Specifications set forth for construction of the system have been devised to ensure system compatibility and performance. Compliance with these specifications will be determined during periodic observations of construction. Repeated failure to comply with the specification will be considered before the initial acceptance phase of the plant commences.

B. Prior to the Contractor performing final testing, deliver preliminary as-build documents to Owner for use in conducting testing observation.

C. Project Record Documentation
   1. Upon completion of final engineering and incorporation of the Architect review comments, Contractor will provide to the Architect for its records the following close out documentation:
   2. Record or As Build Drawings which shall include but not limited to:
      a. Functional block diagrams for each Integrated Audio-Video System
      b. All Integrated Audio-Video or Audio-Visual junction box locations
      c. Audio Visual equipment rack locations
      d. Rack elevations.
         1) Rack elevations shall show all components as installed under this contract.
         2) Contractor will label each component describing the component. (Examples: Cafeteria Amplifier or Gymnasium DSP etc.).
      e. Floor plan drawings with device locations and associated assigned item number.
      f. Mounting detail for equipment and hardware.
      g. Schedule of all devices with associated panel termination, zoning, power circuits, etc.
      h. Corrected product submittal information
   3. A complete inventory list of installed products shall include:
      a. Manufacture Name
      b. Model Number
      c. Serial Number
      d. Room number and/or description of installed location
   4. Operation and Maintenance Manuals shall include:
      a. Include detailed procedures for system operation that begin with startup procedures and continue through system shut down referenced in section 3.3 Training.
      b. List of manufacture recommended maintenance and intervals with manufacture support contact information.

D. Drawings will contain the Contractors own title block on the edge of the drawing and will include the company name, address, phone number and date of the final drawings.
   1. Use of any part of the Architect title block is not acceptable at any time.

E. Drawing documentation will be in the following format:
   1. Two (2) electronic copies, one per flash drive shall be provided.
   2. Drawings will be in both CAD (DWG) and PDF format, and the Contractor will include all files on each drive.
   3. File transfer is acceptable.

F. Drawings shall be provided to the architect two weeks prior to the final testing and commissioning of the system. Coordinate with the Owner during the pre-construction meeting for low voltage Contractors to schedule this delivery date.

G. The drawings will be reviewed on site with the architect and the Owner prior to the final acceptance process. Drawings rejected for any reason will delay the final acceptance process until resolved.

H. Testing Results
   1. In addition to the project record drawings, the Contractor shall provide the testing information for all audio-visual cabling.
   2. Test results shall be provided to the architect two weeks prior to the expected final acceptance of the system(s). Coordinate with the Owner during the pre-construction meeting for low voltage Contractors to schedule this delivery date.

3. The drawings will be reviewed on site with the architect and the Owner prior to the final acceptance process. Test results rejected for any reason will delay the final acceptance process until resolved.

I. Once accepted by the architect and Owner all documentation / program code becomes the property of the Owner.

J. Within ten days of receipt of the final acceptance notice, the Owner's representatives shall schedule and perform the final inspection. When the work is found acceptable under the contract documents and the contract is fully performed, declare substantial completion of the project.

END OF SECTION

SECTION 28 0511
CYBER SECURITY REQUIREMENTS

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 OF WORK

A. Section includes
   1. Contractor shall coordinate with the Owner's information technology department to understand and conform to Owner's standards and guidelines for protecting systems from cyber threats.
   2. Contractor's key personnel responsible for device configuration and programming shall be trained in and follow the best industry practices and manufacturer recommended practices related to cyber security for all devices, servers, software applications and other intelligent components deployed or altered under this scope of work.

B. Related requirements:
   1. Section 27 4116 "Integrated Audio Video Systems"
   2. Section 27 5116 "Public Address Systems"
   3. Section 28 1300 "Access Control Systems".
   4. Section 28 2300 "Video Surveillance Systems".
   5. Section 28 3100 "Intrusion Alarm Systems"

1.03 INFORMATION SUBMITTALS

A. Provide to Contractor with proposal:

B. Manufacturers cyber hardening manuals or guides.

C. Sub-contractor's plan for secure assignment of unique strong passwords to all installed products requiring passwords.

D. List of cloud services and providers to be provisioned.

E. Retain first paragraph below if Contractor is responsible for field quality-control testing and inspecting.

1.04 CLOSEOUT SUBMITTALS

A. Asset Management:
   1. Provide a secured spreadsheet, or equivalent summary, of all security devices and software installed to include:
      a. Manufacturer, model and firmware or software version.
      b. Serial number and MAC address, if applicable.
      c. Network settings, including IP address, VLAN or subnet mask, default gateway.
      d. Equipment location.
      e. Device usernames and passwords.
      f. Licenses:
      g. License files and license key numbers.
      h. Additional codes required for operation.

B. Services and ports:
   1. Summary of enabled and disabled product services.

C. Summary of all open ports.

D. Security recommendations:

E. Summary of additional recommended physical, network, or program actions to enhance the cyber security of the installation.

F. Post-installation vulnerability test report.

1.05 CONTRACTOR QUALIFICATIONS

A. Contractor personnel assigned to device programming and software installation shall have been certified in these tasks by the Manufacturer or possess industry certifications acceptable to the Manufacturer and the Owner attesting to the necessary competence.

PART 2 - PRODUCTS

2.01 NOT APPLICABLE.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Before installation of the system, the Contractor shall coordinate with the Owner's information technology department for the following:
   1. System network settings, including IP addressing, VLANs, firewall ports, et.al.
   2. Anti-virus, anti-malware and other prevention and detection tools on servers and client machines
   3. Operating system versions and patch levels on servers and client machines
   4. Needs and methods for allowing remote access

B. Password provisioning plan.
   1. No devices shall be deployed using their manufacturer default passwords.

C. The Contractor shall insure that all devices to be installed possess the current version of manufacturer firmware or software.

D. All security system components, including servers and client machines, shall be stored in a secure environment prior to installation.

E. Installers shall follow all recommended procedures and guidelines from the Manufacturers to securely provision network connected products.

F. The Contractor and its authorized installers shall:
   1. Complete the Owner-approved asset management worksheet.
   2. Synchronize security devices with a common time base acceptable to the Owner.
   3. Disable all services and ports not required for ongoing system operation, including ICMP and discovery protocols (subject to Owner's standards).
   4. Provision device and system privileges in a manner approved by the Owner.
   5. Ensure only secure versions of all protocols are used, including HTTPS, SFTP, SNMP v3.

3.02 PHYSICAL ACCESS

A. The Contractor and its authorized installers shall make the Owner aware of any physical condition or circumstance at the project site which it deems to constitute a potential cyber risk.

3.03 FIELD QUALITY CONTROL

A. Testing:
   1. In conjunction with the Owner's information technology department, the Contractor shall arrange for a post-installation vulnerability test to verify that additional cyber vulnerabilities have not been introduced into the Owner's network by this project.

END OF SECTION

SECTION 28 0537

EMERGENCY RESPONDER COMMUNICATION ENHANCEMENT SYSTEM (ERCES) – DISTRIBUTED ANTENNA SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

B. City of Forney Texas Ordinances and Specifications.

C. Kaufman County Ordinance and specifications.

D. Other local Ordinance No. based on facility address.

E. It shall be the ERCES Contractor responsibility to confirm governing AHJ prior to proceeding with any design or installation.

1.02 SUMMARY

A. Section includes:

1. This specification has been developed to support the Owner in communicating workmanship and deliverable expectations for an Emergency Responder Communication Enhancement System (ERCES) for Forney Independent School District (ISD) located in and around the city of Forney Texas in Kaufman County.
2. This specification describes the technical and performance criteria for designing and deploying the ERCES (herein referred to as the system).
3. System components include devices such as: bi-directional amplifiers (BDA), donor and coverage antennas, distributed antenna system (DAS) electronics, coax cable and connectors, lightning protectors, grounding kits, and other items necessary for a complete and functioning system.
4. The scope of work includes the complete technical RF survey, design, permitting, implementation, commissioning and turn-over to the Owner of an ERCES.
5. Prior to design, the Owner will require an RF site survey of the facility to establish baseline conditions. Additionally, the Contractor shall confirm the channel count and frequencies with the Authority Having Jurisdiction (AHJ) and the Frequency Owner for Kaufman County and the City of Forney. Contractor shall guarantee coverage for these channels per the criteria stated in this specification.
    a. The Contractor shall base their turnkey bid pricing based on an assumed design that will provide 100% coverage to all buildings in the project. The Owner understands that the system design will not be finalized until after the Contractor performs the RF survey post contract award. Adjustments to the contract value based on the RF survey shall be performed with the Contractor and the Owner and or Owner's Agent. Contractor shall include the cost to perform RF surveys in the proposed lump sum bid.
6. The Contractor shall provide detailed drawings as outlined in the section regarding submittals for each facility, prior to ordering materials.
7. The Contractor shall obtain written consent from the Frequency License Holder (FLH) of the frequencies which the system is intended to amplify, per FCC Rule Section 90.219.
8. The Contractor shall in advance of system implementation submit to the AHJ and obtain written consent from the AHJ for the design and specifications of the system for each facility, per IFC 2021 Section 510.
9. Following installation of the system, the Contractor shall perform a wireless survey using a spectrum analyzer of all areas of a building to verify and document that the deployed system meets the requirements of this specification, all applicable codes and the AHJ.

This shall include a walk of each facility with the AHJ to test their radio communications. The contractor is required to coordinate with the AHJ for all site walks and tests.

10. The contractor's proposal shall include all costs that may be associated with a third party verification for the purpose of performing final testing and acceptance. It will be the responsibility of the contractor to ensure local requirements do or do not include such a requirement.
11. The Contractor shall provide the Owner with a maintenance contract for the system to be in effect for a period of at least twelve months following final commissioning and turnover of the system. The contract shall provide for 24-hour, 7-day response within two hours of notification of a problem.
12. The Contractor shall perform the first annual inspections of the systems as required by IFC 2021 Section 510 and submit the verification reports to the appropriate AHJs and the Owner.

B. Related requirements
   1. IFC – 2024
   2. NFPA 1 – 2021
   3. NFPA 72 – 2022
   4. NFPA 1225 – 2022 (including NFPA 1061 and 1221 versions)
   5. FCC Rule Section 90.219
   6. UL 2524
   7. TIA TSB-88.1E

1.03 DEFINITIONS

A. BDA – Building Distribution Amplifier

B. DAS – Distributed Antenna System

C. ERCES – Emergency Responder Communication Enhancement System

D. FCC – Federal Communications Commission

E. ICC – International Code Council

F. IFC – International Fire Code

G. NEC – National Electric Code

H. NFPA – National Fire Protection Association

1.04 PERFORMANCE REQUIREMENTS

A. This specification outlines an in-building two-way emergency responder communication enhancement system. All addresses, frequencies, tower locations or other information provided in this specification must be confirmed by the Contractor.

B. The system must extend first responder radio coverage throughout the building in accordance with applicable code provisions.

C. The system must be flexible, scalable, and provide a multi-band and multi-protocol solution.

D. The system shall comply with NFPA 72 – 2019, NFPA 1221 – 2019, and IFC 510 – 2021. The products selected for the system must conform to UL 2524 and all signal boosters shall not exceed the parameters established under FCC 90.219(d)(6) deployment rules.

E. The system must support the technologies used by the first responder agencies in the area where the facility is located, providing complete building coverage for all frequencies used by them. This includes but is not limited to the following:
   1. Any digital P25 system used by the Forney Independent School District, the City of Forney, or Kaufman County and any other local or county jurisdiction providing first responder services to the facility.

2. The full 700/800 MHz public safety frequency range as used by the city and county agencies.
3. Both P25 Phase 2 TDMA and Phase 1 FDMA radio systems if used.
4. Additional ranges and frequencies as required.

F. The Contractor shall verify the public safety radio systems and frequencies used by the relevant responder jurisdictions.

G. The system shall be designed to provide 100% coverage of the building with the minimum signal levels required by the prevailing code for the area where the project is located. This exceeds the requirements of NFPA and IFC.

H. Coverage antennas requiring local power supplies shall not be used. All power for coverage antennas must come from the system head end.

I. The system signal levels, antenna isolation factors, oscillation detection and uplink noise suppression functions shall conform to AHJ requirements and / or local jurisdiction fire code:

J. The system shall be monitored by the fire alarm system to comply with NFPA 1221 and NFPA 72 requirements. The Contractor shall coordinate with the Owner and the Owner's designated fire alarm system service providers for proper integration to the FACP.

K. The system shall be powered by two independent sources:
1. The primary power shall be supplied by a dedicated twenty (20) amp branch circuit provided by the onsite electrician.
2. Contractor shall provide and install a dedicated stand-by battery (UPS) system capable of operating the system at 100 percent capacity for a minimum of 12 hours.

L. Donor antennas will be installed on the roof of the facility. Contractor shall coordinate the placement of the antenna with the Owner's roofing contractor. Any sleds used for antenna placement shall conform to NFPA requirements including proper anchoring and signage.
1. Antenna mounting details must be approved by the Architect and Consultant prior to the purchase of all materials.
2. Donor antennas must not exceed the height of any current antenna system deployed on the roof of the facility.

1.05 CONTRACTOR QUALIFICATIONS

A. Acceptable manufacturers:
Comba CriticalPoint
Comba USA
568 Gibraltar Dr
Milpitas CA 95035
408-526-0180

B. Contractor
1. The Contractor selected to provide the installation of this system shall be certified by the manufacturing company in all aspects of design, installation, and able to provide warranty service of the products described herein. Certifications shall be provided in the submittals.
2. The system designer and the lead installation personnel shall be certified by the manufacturer or other approved school or organization such as the NICET IB-PSC as an example.
3. The Contractor shall utilize the authorized manufacturer components in provisioning this Project.
4. Contractors shall comply with all federal, state, and local statutes regarding qualifications and licensing of firms.
5. The Contractor shall be experienced in all aspects of this work and will be required to demonstrate direct experience of recent systems of similar type and size.

6. Owner reserves the right to reject bid from any bidder who has previously failed to perform properly, or complete contracts of a similar nature on time.
7. No subcontractors are permitted unless they meet all training and certification requirements equal to or greater than the approved Contractor. This includes all cable installation, testing and certification of the system.

C. No portion of this project shall be performed by subcontractors, unless approved by Owner or Owner representative.

D. Unqualified bidders may not partner with a qualified bidder for any reason without pre-approval from the Owner.

1.06 SUBMITTALS

A. No portion of the work shall commence, or equipment ordered until the architect, consultant, and engineering team (A/E) and Owner have approved the submittals.

B. Successful Contractor shall submit an electronic PDF copy of the submittal package within 15 days of written notification to proceed with or other written documentation from the Architect or General Contractor. Documents shall be issued in the following order:

C. Action Submittals
1. Prior to beginning system implementation, the Contractor shall review their design with the Owner and provide the Owner copies of the written consents:
   a. Copies of the signed agreements of the AHJ for the facility.
   b. Copies of the signed agreements with the frequency licensees.
2. Manufacturer's catalog information showing dimensions, colors, and configurations.
   a. Submittals will include all items listed in PART 2 – PRODUCTS of this document and the manufacturers cut sheets for the following:
   b. Provide manufacturers cut sheets for each piece of equipment specified. Include the manufacturer name, model number and description of each listed component.
   c. If the data sheet includes multiple part numbers or models the bidding Contractor will indicate which model is being submitted by clouding or highlighting the appropriate model number.
3. Warranty Documentation
   a. Complete documentation regarding the manufacturer's warranty will be submitted as part of the proposal. This will include, but is not limited to, a sample of the warranty that would be provided to the customer when the installation is complete and documentation of the support procedure for warranty issues.
4. Contractor heat maps of the survey performed to determine the size and coverage capabilities of the system shall accompany the subsequent design for that facility.
5. Design drawings
   a. Drawings shall provide all cable pathways, interior antenna locations, exterior donor antenna location, wall, floor and ceiling penetrations and enclosure locations inside the IDF room.
   b. Construction details related to the use of mounting the donor antenna to include mounting details.
   c. Elevation details for the enclosures and battery backup units.
   d. Grounding details for the antennas, conduits, sleds, or other devices as applicable.
   e. Single line riser plans show all components and their connections in the system.
   f. Drawings must include symbol and cable pathway legends.
   g. Title blocks must contain the Contractor's name, office address, phone number. Use of the Consultant's title block is forbidden and will result in an automatic rejection.

D. Informational Submittals
1. Provide all company certifications and all technician certifications from the manufacturer. All certificates must be current.

a. Letters from the manufacturer indicating the Contractor has been successfully certified by the manufacturer are also acceptable in lieu of a company certificate.

E. Close out Submittals
1. Record drawings shall be provided in the close out submittal.
a. Legible floor plans containing detail names for each floor plan view and elevation view
b. Sheet titles including:
1) The facility's name and address.
2) The Contractor's name and address.
c. Site plan showing the facility and surrounding property, a north arrow, and the location and orientation of the system rooftop mounted antenna(s)
d. The System Performance Narrative mandatory language shall comply with local ordinance based on location of the facility.
e. Heat map from the BDA signal strength testing.
f. A functional schematic drawing of the overall system with all its components including the connection to the FACP.
g. Antenna, splitter, coupler, and other passive device locations.
h. Cable routes for all horizontal and backbone pathways.
i. Location of roof penetrations and donor antenna(s).
j. System and donor antenna grounding and lightning protection details.
k. Frequencies / channels being enhanced by the system.
l. Stand-by power source location.
m. An asset management worksheet, to include:
1) Manufacturer, model, and firmware or software version
2) Device logical names
3) Serial number if applicable
2. Manufacturers cut sheets on all equipment used in the system.
3. Test and Verification Data:
a. Verification of 100% building coverage by use of a spectrum analyzer, following IFC 2021 500.5.4 grid testing methods
b. Delivered audio quality (DAQ) results in cooperation with the AHJ, as required.
c. TDR sweep testing results for all coax cable runs, reference the testing section for additional details related to segment and system testing requirements.
d. OTDR test results for all fiber runs if applicable.
e. Calibration certification of all testers used on the project.
f. Current technician certification from the tester manufacturer.
4. Operation and Maintenance Data:
a. Operation and maintenance manuals
b. Manufacturer's specification sheets
c. Active component locations, layout, and configuration
5. Copies of the signed agreements of the AHJ for each facility, per 1.3.B.2 of this specification
6. Copies of the signed agreements with the frequency licensees per 1.3.B.3 of this specification

F. All documents shall be transmitted electronically in PDF format.

1.07 QUALITY ASSURANCE

A. Contractors shall have a documented quality assurance program. This program shall have internal inspection team(s) to measure the service and product quality produced by the Contractor's technicians against internal and Industry standards.

B. The Contractor will be liable for all damages to portions of the building caused by it, including but not limited to the following:
   1. Damage to any portion of the building caused by the movement of tools, materials, or equipment. This shall include the replacement of broken ceiling tiles. Obtain ceiling tile stock from the Owner as needed. Owner reserves the right to charge the Contractor for excessive damages to ceiling tiles.
   2. Damage to any component of the construction of spaces "turned over" to the Contractor.
   3. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the Contractor or other actions of Contractor.
   4. Other damage to the materials, tools and/or equipment of Owner or other Contractors, agents, and lessees.

1.08 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of the delivery storage and handling specification sections in the project specification book.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Stored materials shall be protected from exposure to harmful environmental conditions and at temperature conditions recommended by manufacturers.

D. Handle products and systems in accordance with manufacturer's instructions.

E. Contractors are required to remove all empty containers and other trash associated with the system. This includes all packaging, excess cable and other materials that hold no value to the Owner.

1.09 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
   2. Do not begin installation until you are instructed to perform by the Owner Agent.
   3. While on campus or on any land owned by The Owner all Contractors will comply with Owner policies concerning alcohol, tobacco, and firearms as well as any other Owner policy governing dress, behavior etc.

1.10 COORDINATION

A. Single Point of Contact / Project Manager
   1. Contractor shall provide a single point of contact, i.e., Project Manager, to speak for the Contractor and to provide the following functions:
      a. Initiate and coordinate tasks with the Owner Technology Projects Manager, its General Contractor, Architect, and others as specified by the Architect or General Contractor.
      b. Provide day-to-day direction and on-site supervision of Contractor personnel.
      c. Ensure conformance with all Contract provisions.
   2. If the Project manager is unable to remain continuously on site a project, Forman shall be required to remain. The project supervisor shall be responsible for day-to-day activities and reporting all status to the Project Manager.

B. The Contractor shall coordinate the following with the Owner:
   1. Roof penetrations, including use of existing penetrations or location and construction requirements for any new penetrations.
      a. The Contractor shall coordinate the placement of the roof penetration, the sled, and the roofing piers with the roofing contractor and the architect.

b. The roofing contractor shall perform all roofing penetrations. This shall include the penetration and the roof boot.
c. The Contractor shall provide the conduit and weather head.

2. Final placement of enclosures in the IDF room, both system electronics and battery backup as per the contract drawings.
3. Electrical circuits for BDA enclosures and power supplies (electrical power shall be provided by the construction project Div 26.)
4. Connection to the monitored FACP. The Contractor shall coordinate response to alarm conditions / fault codes, originating from the BDA to the fire alarm monitoring company for proper response by the Owner or Owner approved agency. The fire alarm Contractor shall make the final connection inside the FACP with a cable provided by the ERCES Contractor.

C. The Contractor shall coordinate and provide all required permits, site surveys, and inspections as required by the AHJ including the AHJ Approval Letter.

D. The Contractor shall obtain and provide the FCC license holder approval letter, FCC repeater registration (if applicable).

E. Technical Support
1. Contractor shall provide technical support consisting of two technicians for a full working day when Owner deems necessary during the physical move to the site.
2. The personnel providing technical support shall:
a. Have intimate knowledge of the system and materials that were used.
b. Be skilled in all use of equipment and materials used under the Contract.
c. Be competent to troubleshoot and fix problems associated with Contractor provided materials.
d. Have the test equipment, tools, and materials needed to troubleshoot and remediate problems associated with Contractor provided materials and installation.

F. The contractor shall not coordinate directly with the Owner or Consultant.

G. All coordination shall be documented in writing in a format approved by the Architect.
1. Examples of coordination with the Owner are obtaining all the required IP addresses and finalizing camera fields of view.

H. All coordination shall be documented in writing in a format approved by the Architect.

I. Coordination of site walks, overheads, finals must be coordinated with the General Contractor and Architect with a minimum of five (5) business days' notice that a system is ready for review by the Consultant.

1.11 WARRANTY

A. The Contractor warrants to the Owner that all materials and equipment furnished under this specification will be new unless otherwise specified, and that all Work will be of excellent quality, free from faults and defects and in conformance with the specification. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

B. The Contractor warrants the materials, workmanship, and work to be in conformance with the Contract Documents included in this Project, for one full year from the approved substantial completion date unless a longer warranty or special guarantee is specified. Contractor shall assign to Owner all warranties and guarantees from or rights against any manufacturer, supplier or distributor of equipment, fixtures and other material installed in or incorporated in the Work at the time of Acceptance by Owner.
1. Contractor Labor Warranty Period: One (1) year after date of Final Acceptance.
2. Product Warranty Period: Ten years after the purchase date of equipment.

C. The Warranty binds the Contractor to correct any work that does not conform to such Contract Documents or any defects in workmanship or materials furnished under this Contract which may be discovered within the one-year period. The Contractor shall, at its own expense, correct such defect after receiving notice from the Owner by repairing it to the condition called for in the Contract Documents.

D. Contractor shall warrantee the repaired/replacement item for one year from date of repair/replacement. This warranty shall cover parts, labor, travel, and all other expenses.

E. All replacement, installation, integration, maintenance, and testing provided in conjunction with the warranty provisions of such contract will be provided at no additional cost to the Owner.

F. Additional Warranty
   1. Contractor will state any additional Contractor supplied warranty.

G. Contractor shall provide the Owner with a list of all contact information for warranty purposes to include phone numbers, email addresses and business and technical support hours.

H. All recall notices occurring during the manufacturer's warranty period will automatically be forwarded to the Owner.

I. All recall notices occurring after the expiration of the manufacturer's warranty will be forwarded to the Owner for a period of 2 years after the warranty expires.

J. Service Under Warranty
   1. Warranty service shall be on a 24-hour/day, 365-day/year basis with a response time not to exceed four hours. The respondent shall certify that its proposed service facility shall initiate, within one business day, on-site repair to any critical system product that fails while under warranty.
   2. Upon receipt of written notice, Contractor shall remedy defects within two calendar days, or the Owner shall seek other means to correct the defects and the Contractor, or its surety shall be liable for expenses.
   3. If it becomes necessary for the Owner to contract out for warranty repairs, due to an inability or failure of the Contractor to perform such repairs, the Contractor shall reimburse the Owner for all invoices for parts, labor, materials, travel, per-diem, and all other related expenses such as shipping/handling costs to perform such repairs, within 30 days from presentation of an invoice from the Owner. This shall only occur after the Contractor has been given two calendar days to respond and correct the problem. The cost limit for such repairs will not exceed the actual costs as listed above, which are related to the repairs.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Bi-directional amplifier, and battery backup unit:
   1. Approved manufacturer Comba CriticalPoint

B. Cabling and connectors / couplers:
   1. RFS or other Owner approved equivalent for cabling.
   2. Cabling shall include the necessary connectivity to connect to the FACP located in the reception areas.
   3. All cabling shall meet the application for which it is installed. Ex: do not use indoor rated cabling on the roof for the donor antenna etc.
   4. All above ceiling cables shall be plenum rated. Use 2-Hour rated cabling when and where required by code or local ordinance.
   5. Splitters sized and in quantities as needed for the design.
      a. Acceptable manufacturer: Comba

2.02 COMPONENTS

A. Contractors shall design, provide, and install all passive and active components and pathway support materials.

B. All antennas, cables, and equipment enclosures shall meet requirements of NFPA 1221.

C. All components shall be installed in code approved enclosures, example:
   1. Backup Power: The uninterruptible power supply (UPS) battery backup shall be installed in a NEMA 3R enclosure

2.03 SLEDS – ONLY IF APPLICABLE.

A. If a sled is determined to be required for antenna mounting, then the Contractor shall provide and install the sled. This shall include all cable pathways from the sled to the roof penetration.

B. All sleds must be properly secured to the roof and done in coordination with the Owner roofing Contractor and NFPA 1221 requirements.

C. All sleds must be equipped with a sign warning that the sled cannot be moved without first obtaining permission from the fire code official per NFPA 1221. All wording shall follow IFC510.

2.04 NON-CONTINUOUS CABLE SUPPORTS AND ROOFTOP PATHWAYS

A. Rooftops
   1. Roofing piers shall be used to support cabling located on the roof. Donor cables shall not rest on top of the roof.
   2. Conduit shall be used on the roof for any donor cable pathway that travels greater than ten feet from the roof penetration to the donor antenna.

B. Indoor pathways
   1. Non-continuous cable support shall be manufactured by Erico Caddy J-Hooks, Panduit, or approved substitute.
   2. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed.
   3. Non-continuous cable support shall have flared edges to prevent damage while installing cables.
   4. Non-continuous cable supports sized 1 5/16” and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.
   5. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.
   6. Stainless Steel non-continuous cable supports are intended for indoor and outdoor use in non-corrosive environments or where only mildly corrosive conditions apply.
   7. If required, assemble to manufacturer recommended specialty fasteners including beam clips, flange clips, C and Z purlin clips.
   8. Conduit edges must be free of burrs and installed with bushings to protect the cable jacket from damage.

2.05 SLEEVES AND FIRESTOP

A. UL Listed fire stopping methods that match the fire rating of the wall or floor being penetrated are to be used at all fire barrier penetrations. Seal the interior of the conduit sleeve around the cables and around the outside of the sleeve on each side of the penetration with firestop caulk or putty, install according to the manufacturers’ instructions.

B. All penetrations through fire rated walls or floors shall feature a suitable length of metal conduit. Hole diameter shall not exceed ½” larger than the conduit or sleeve to be installed. The hole shall be neatly cut, not oversized or irregular. Do not share wall/floor penetrations with ductwork, piping, line voltage electrical conduits, etc.

C. All gypsum board or plaster penetrations shall be made using an appropriate hole saw / mandrel or manufactured assembly.

D. Cable pathway sleeves shall consist of properly sized sleeves, equipped with a bushing on both sides for all fire wall or floor or roof penetrations.

E. Use of sleeves pre-loaded with fire stop, such as the Wiremold EZ Path, Flamestopper through wall fittings is approved for use in all firewall locations. These devices do not need to be used in areas where fire-rated assemblies are not being used. This includes all sleeves over hard ceilings, exposed ceilings etc. Product shall be installed prior to cable installation for protection of cables.

F. Firestop all sleeves, floor, and ceiling penetrations to meet the same requirements as the fire rated assembly.

G. Seal all conduits entering the IDF room to meet wall assembly ratings and local code requirements.

H. Contractor shall determine fire wall locations and provide the appropriate quantity of sleeves as needed.

2.06 GROUNDING

A. Items located inside the IDF room may be grounded to the existing ground bar. Grounding shall be in accordance with NEC and NFPA and the system manufacturer instructions.

B. Grounding Lugs
   1. All grounding lugs shall consist of two-hole lugs, long barrel with no less than two irreversible crimps and conductive grease.
   2. Both holes in the lugs shall be secured with appropriate hardware.
   3. Attaching hardware shall be firmly secured fasteners shall be appropriately sized bolts and nuts.
   4. Grounding lugs shall have a metal to metal attaching connection.
   5. Painted and coated surfaces shall be neatly prepared for grounding lugs. Excessive removal of painting and/or coating shall be corrected with new product at Contractor's sole expense.
   6. Contractor shall follow manufacturer's technical instructions for installation.

C. Contractors shall be responsible for ensuring their ground lugs will fit the hole patterns on the existing ground bars used in the MDF or IDF room.

D. The Contractor shall attach grounding cable to appropriate end connecting hardware using manufacturer-approved materials and methods. All cables shall be properly sized with a no less than #6AWG stranded copper wire cable being used.

2.07 UNSPECIFIED EQUIPMENT AND MATERIAL

A. Any item of equipment or material not specifically addressed on the drawings or in this document and required to provide a complete and functional installation will be provided in a level of quality consistent with other specified items is the responsibility of the Contractor.

PART 3 - EXECUTION

3.01 CABLE PATHWAYS AND SPACES

A. All indoor cabling installed for this system shall be supported with J-hooks secured to the building structural steel or by dedicated all thread rods. Contractors will not share pathways with any other low voltage structured cable plant.

B. Contractor will not secure J-hooks to grid wire supporting other trades or ceilings for any reason. Grid wire may be used to support independent J-hooks providing it is properly secured to the building structure and dedicated to supporting the installed cable. J-hooks will be spaced 48-60" apart.

C. Do not secure cable pathways to ducts, pipes, electrical conduits, fire sprinkler heads or other utilities found in the overhead ceiling. Pathways not conforming to these requirements will be corrected by the Contractor immediately.

D. Do not allow cables to touch or rest on the building structural systems, conduits, pipes, duct work, fire sprinkler heads, environmental sensors, or other items in the ceiling space.

E. Do not use plastic zip ties on any cable pathway for any reason.

F. Maintain all bend radius requirements as provided by the cable manufacturer.

G. Do not exceed manufacturer recommended pulling tensions for any cable.

H. Cable pathways shall not be parallel to electrical pathways without proper separation and shall avoid crossing over electrical rooms.

I. Do not create openings on any wall without an approved sleeve. All sleeve locations shall consist of EMT equipped with white plastic or nylon bushings. Do not share pathway sleeves with existing cable or other utilities. Do not use PVC or other plastic materials for sleeve penetration.

J. All cabling shall be labeled with wrap around machine generated labels. No handwritten labels are acceptable. All labeling must be clearly legible. Coordinate labeling requirements with the Owner prior to installation. Labels shall be white fields with black alphanumeric characters.

K. Fire stopping equipment and practices will comply with applicable national and local codes.

L. Prior consent
   1. The Contractor will make no penetration of floors, fire-rated walls, or ceiling without the prior consent of the Owner.

M. Sealing of openings between floors, through rated fire and smoke walls, existing or created by the Contractor for cable pass through will be the responsibility of the Contractor. All sleeve penetrations located in fire wall assemblies shall be fire stopped to match the rated wall assembly.

N. Sealing material and application of this material will be accomplished in a manner acceptable to the local fire and building authorities having jurisdiction over this work.

O. Creation of such openings as are necessary for cable passage between locations as shown in the drawings will be the responsibility of the Contractor's work.

P. Any openings created by or for the Contractor and left unused will also be sealed as part of this work.

3.02 DEVICE INSTALLATION

A. Components of the system will be installed in a neat, professional manner.

B. Donor antennas shall be installed in conformance with IFC 510-2021.

C. All ceiling coverage antennas shall be supported from the structure following manufacturer methods, utilizing proper anchoring devices and techniques.

D. Battery backup shall be labeled with the date of installation inside the panel.

E. Cabling installed to the FACP shall include enough slack for the fire alarm Contractor to route inside their panel.

F. Do not place antenna arrays in a location where existing antennas or other installed rooftop systems degrade the signal.

G. Do not install antennas where it can generate unwanted noise into adjacent metal surfaces or in any way that degrades system performance.

3.03 PROGRAMMING

A. Contractor shall perform all system set up, programming and finalizing the system to ensure radio coverage meets code.

3.04 TESTING AND FINAL ACCEPTANCE

A. All antenna feed lines shall be tested for Return Loss and Distant to Fault (DTF) to verify proper installation and no damage to the coax cabling.

B. Contractor shall perform segment testing immediately following the installation of the segment. Return loss testing must be tested with a precision load on all segment tests.

C. Contractor shall perform a system test following the installation of all cabling, termination hardware and antennas.

D. Final test results shall be provided to the Owner as part of the close-out documentation.

E. All testing equipment must have a calibration date of less than twelve months from the day of use unless the manufacturer has a documented calibration requirement of more than twelve months.
   1. The calibration testing certificate shall be provided with the test results in the close out document package along with a letter from the manufacturer should their calibration period exceed twelve months.

F. All technicians using the testing equipment must be trained and certified by the manufacturer. Provide certs for each technician performing the testing at each facility with the final testing results.

G. The Contractor will perform on-going reviews of all work for compliance with the contract documents with a representative from the Owner. This shall include all overhead pathways, sealing of conduit sleeves and overall installation workmanship.

H. Final acceptance testing / commissioning will be performed in accordance with the AHJ and the Frequency License Holder.

I. Final acceptance will not be given until all locations installed in the field are verified on the Contractor's closeout record drawings, the system functionality is verified by the Owner and all close-out documents, per Section 1 of this specification, have been received by the Owner.

END OF SECTION

SECTION 28 1300
ACCESS CONTROL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Related Documents: Division 00 – Procuring and contract documents, General and Supplementary Conditions of the Contract, Division 01 General Requirements

B. Applicable portions of general requirements/provisions shall be considered a part of this section and shall have the same force as if printed herein full. In addition, all information related to communications infrastructure that is documented in the architectural, structural, mechanical, and electrical drawings/documents shall be included as part of the contract documents.

C. 28 0511 Cyber Security Requirements

D. 28 1300 Access Control Systems

E. 28 2300 Video Surveillance Systems

F. Manufacturer hardening guides

1.02 SUMMARY OF WORK

A. Section includes:
   1. Furnish and install, complete with all accessories, a certifiably functioning Access Control System as per the drawings and specifications.
      a. This shall include all panels, cable, card readers, toll tag readers and pedestals for vehicular traffic as shown in the drawings.
   2. The Contractor shall provide all materials, equipment, labor and all other incidental materials and appliances necessary, as described herein and in the drawings, to provide a complete turnkey and functional system, regardless of any materials and/or equipment not listed or described in this specification and/or supplementary drawings.
   3. The system will use the Owner's Wide Area Network (WAN) for any required connectivity.
   4. Any cable plant run in an outside conduit will be rated for outside plant conditions.
   5. Provide operational programming support as outlined in the specifications.

B. Related Requirements
   1. TIA 569 C– Telecommunications Pathways and Spaces
   2. ANSI/TIA/ 606-B – Administration Standard for Commercial Telecommunications Infrastructures
   3. ANSI/TIA-862-A – Building Automation Systems Cabling, published 2011.
   4. International Standards Organization/International Electro Technical Commission (ISO/IEC) DIS 11801, Second Addition, 2002 – 2009.
   5. International Standards Organization (ISO) 7816
   6. Underwriters Laboratories (UL®) Cable Certification and Follow up Program.
   7. National Electrical Manufacturers Association (NEMA)
   8. American Society for Testing Materials (ASTM)
   9. National Electric Code (NEC®), Latest Issue
   10. Institute of Electrical and Electronic Engineers (IEEE)
   11. UL Testing Bulletin

1.03 DEFINITIONS

A. A&E: Architectural and engineering team to include all design consultants.

B. 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.

C. AHJ: Authority Having Jurisdiction

D. ARC: Aluminum rigid conduit.

E. AWG – American Wire Gauge – The standardized system for gauging the diameter of round, solid, non–ferrous, electrically–conducting wire.

F. BICSI: Building Industry Consulting Service International.

G. BOM: Bill of Materials

H. DPS – Door Position Switch

I. EF – Entrance Facility – An entrance to a building for both public and private network service cables, including wireless, that includes the entrance point of the building and continues to the entrance room or space.

J. IDF: Intermediate Distribution Facility

K. MDF: Main Distribution Facility

L. NFPA: National Fire Protection Association

M. RCDD: Registered communications distribution designer.

N. REX: Request to exit.

1.04 PERFORMANCE REQUIREMENTS

A. The Contractor shall provide and pay for all materials, supplies, machinery, equipment, tools, superintendence, labor, services, insurance, and all water, fuel, transportation, and other facilities necessary for the execution and completion of the work covered by the Contract Documents.

B. Unless otherwise specifically provided in this Contract, all equipment, material, and articles incorporated in the work covered by this Contract are to be new and of the most suitable grade for the purpose intended.

C. All work under this Contract shall be performed in a skillful and professional manner. The Contractor agrees to employ only orderly and competent employees, skillful in the performance of the type of work required under this contract; and agrees that whenever informed by the Owner in writing that any employee(s) on the work is (are), in its opinion, incompetent, unfaithful or disorderly, shall be discharged from the work and shall not again be employed on the work without the Owner's written consent.

D. Materials or work described in words, which so applied, have a well-known technical or trade meaning shall be held to refer to such recognized standards. Neither custom nor usage of trade shall require the Owner to accept materials or workmanship not in strict and complete compliance with the Contract Documents.

E. The Owner makes no representations as to the accuracy or completeness of the site information furnished to the Contractor by the Owner and does not expressly or impliedly warrant same and is not responsible for any interpretations or conclusions reached by the Contractor with respect thereto. It is Contractor's sole responsibility to verify to its own satisfaction all site information.

F. The Contractor is responsible for having visited the site and ascertained pertinent local conditions such as location, accessibility, and character of the site or building, the character and extent of existing work within and adjacent to the site, and any other work being performed thereon at the time of the submission of his proposal. Any failure to do so will not relieve him of responsibility for successfully performing the work without additional expense to the Owner.

G. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported to the Owner at once.

H. If in the performance of the Contract, subsurface, latent, or concealed conditions at the site are found to be materially different from the information included in the specification and the resulting Contract Documents, or if unknown conditions of an unusual nature are disclosed differing materially from the conditions usually inherent in work of the character shown and specified, the Owner shall be notified in writing of such conditions before they are disturbed. A/E, with the approval of the Owner, will promptly make such changes the Specifications as deemed necessary to conform to the different conditions, and any increase or decrease in the Work, or in the time within which the Work is to be completed, resulting from such changes will be adjusted by Change Order subject to the prior approval of the Owner.

I. Before submitting its proposal to the Owner, and continuously after execution of the Contract, the Contractor shall carefully study and compare this specification and shall at once report to the Owner any error, inconsistency, or omission the Contractor may discover, including any requirements which may be contrary to any law, ordinance, rule, regulation, or order of any public authority bearing on the performance of the work. By submitting its proposal for the Contract and the Work, the Contractor agrees that the specification and resulting Contract Documents appear accurate, consistent, and complete as far as can be determined. If the Contractor has reported in writing an error, inconsistency, or omission, has promptly stopped the affected work until otherwise instructed, and has otherwise followed the instructions of the Owner, the Contractor shall not be liable to the Owner for any damage resulting from any such errors, inconsistencies or omissions in this specification and resulting Contract Documents. The Contractor shall perform no portion of the Work at any time without the Contract Documents and, where required, approved Project Drawings, Product Data or Samples for such portion of the Work.

J. The Contractor shall perform the Work in accordance with the Contract Documents and submittals.

K. The Contractor shall arrange for the securing of all necessary permits and pay for same.

1.05 QUALIFICATIONS

A. Acceptable Manufacturer
   1. The following manufacturer's systems will be acceptable for this project:
      Avigilon USA
      1717 McKinney Ave Dallas, TX 75202
      Ph: (888) 281-5182

B. Contractor
   1. Bidders who do not currently possess the necessary qualifications, trained and experienced personnel, financial capacity, current state licenses (as required by the Texas Department of Public Safety Private Security Bureau), and meet the other requirements herein described will be disqualified.
   2. The Contractor, as a business entity, shall be an authorized and designated representative/Dealer of the equipment used in this specification, with full warranty privileges, and shall have been actively engaged in the business of selling, installing, and servicing surveillance systems for a period of at least three (3) years The Contractor, as a business entity, shall have successfully installed a minimum of three similar-sized systems that are currently operating to the Owner's satisfaction.
      a. Integrators must be certified by the manufacturer to bid on this work.
         1) Contractors who are in the process of becoming certified with the specified manufacturer may not be selected.
   3. The preferred Contractor will have a minimum of five (5) years of access control installation experience with K-12 schools in Texas.
   4. The Contractor will comply with all federal, state, and local statutes regarding qualifications of firms.

5. The Contractor will have adequately trained personnel in the usage of such tools and equipment and will provide a quantity of certified technicians as part of their submittal response.
6. The Contractor must have previously established offices located within 120 miles of the Owner's Administration Building.
7. The Contractor shall not have any grievances or complaints of record regarding workmanship, code compliance or service response. A Contractor that has any prior finding(s) of a license violation or has any litigation in process is unacceptable.
8. The Owner reserves the right to reject the bid of any bidder who has previously failed to perform properly, or complete on time, contracts of similar nature.

C. Subcontractors

The use of qualified sub-Contractors to an unqualified security Contractor for this project is not approved.

1.06 SUBMITTALS

A. No portion of the work shall commence, or equipment ordered until the architect, consultant, and engineering team (A/E) and Owner have approved the submittals.

B. Successful Contractor shall submit an electronic PDF copy of the submittal package within 15 days of written notification to proceed with or other written documentation from the Architect or General Contractor. Documents shall be broken by the following:

C. Action Submittals
1. Provide manufacturers cut sheets for each piece of equipment specified. Include the manufacturer name, model number and description of each listed component.
   a. If the data sheet includes multiple part numbers or models the bidding Contractor will indicate which model is being submitted by marking the appropriate model number with an "X" or an arrow.
2. Shop drawings are required for the submittal package and will contain the following information:
3. Shop drawings are required for the submittal package and will contain the following information:
   a. Identify the location of each device as per the Security drawings to include all door contacts, motion sensors, access control panels, devices and other devices associated with the access control systems.
   b. Each device shall be labeled as per the direction of the Owner's Representative and Owner.
   c. Drawings will include the schematic wiring layouts of each access control panel location to include all labeling. Panels shall be broken out by campus and by MDF or IDF room as needed.
   d. Title blocks used on all drawings will be that of the Contractor and shall include the following:
      1) Company name,
      2) Company address and phone number for service.

D. Informational Submittals
1. Provide a copy of current manufacturer certifications for the company and for all personnel who will provide services on this project.

E. Closeout Submittals
1. The Contractor shall be furnished with either a set of CAD files or the Revit model to use for record drawings.
2. Maintenance Data: Include manufacturers' operating instructions, original copies of all software, recommended maintenance required and maintenance intervals.
3. A complete parts list of additional materials provided as attic stock – if applicable.
4. A spreadsheet containing the following information about the access control system:

a. Panel Name (Coordinate with Owner)
b. IP Address (Obtained from Owner)
c. MDF or IDF room that the panel originates in as per the design documents.
d. The port number of the patch panel the panel is connected.
e. The port number of the switch is connected to the panel. (Obtained in coordination with Owner)

5. Record drawings shall show the following:
   a. Update the original submittals of the floor plans. Relocate any device that may have been moved or altered during the life span of the project.
   b. Each device shall be labeled as per the direction of the Owner representative.
   c. Devices shall include all door contacts, motion sensors, access control panels, and other devices associated with the access control systems.
   d. Show all cable pathways used to reach each device location.
   e. Provide panel elevation details and the location of all devices inside the panel that match the outlines left in each panel location as described in section two of this specification.
   f. Drawings will contain the contractors own title block on the edge of the drawing. The title block shall contain the following information and adhere to the following requirements.
      1) Company name
      2) Company address and phone number for service
      3) The date on the drawings will match the date of acceptance for warranty purposes.
      4) Do not use any part of the consultant / architect title block, copyright data or seals. Failure to remove these items will result in the document being returned stamped “revise and resubmit.”
6. Drawings will be issued in PDF format.
7. Provide all drawings in black and white. Do not provide electronic drawings in color.

F. Drawings shall be provided to the A/E for review and acceptance prior to the Owner’s final acceptance of the project.
   1. The drawings will be reviewed with the A/E and the Owner prior to the final acceptance process. Drawings rejected for any reason will delay the final acceptance process until resolved.
   2. Completed record drawing will be required for use during the final acceptance process of the construction project. Failure to produce the record drawing during this process will result in a delay in the final acceptance of the project.

1.07 QUALITY ASSURANCE

A. Contractors shall have a documented quality assurance program. This program shall have internal inspection team(s) to measure the service and product quality produced by the Contractor’s technicians against internal and Industry standards.

1.08 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of the delivery storage and handling specification sections in the project specification book.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Protect stored materials from exposure to harmful environmental conditions and at temperature conditions recommended by the manufacturer.

D. Handle products and systems in accordance with manufacturer's instructions.

E. Contractors are required to remove all empty containers and other trash associated with the system. This includes all packaging, excess cable and other materials that hold no value to the Owner.

1.09 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
   2. Do not begin installation until instructed to perform by the Owner Construction Manager at Risk.
   3. While on campus or on any land owned by The Owner all Contractors will comply with Owner policies concerning alcohol, tobacco, and firearms as well as any other Owner policy governing dress, behavior etc.

1.10 COORDINATION

A. Single Point of Contact / Project Manager
   1. Contractor shall provide a single point of contact, i.e., Project Manager, to speak for the Contractor and to provide the following functions:
      a. Initiate and coordinate tasks with the Owner Technology Projects Manager, its General Contractor, Architect, and others as specified by the Architect or General Contractor.
      b. Provide day-to-day direction and on-site supervision of Contractor personnel.
      c. Ensure conformance with all Contract provisions.

B. Technical Support
   1. Contractor shall provide technical support consisting of two technicians for a full working day when Owner deems necessary during the physical move to the site.
   2. The personnel providing technical support shall:
      a. Have intimate knowledge of the system and materials that were used.
      b. Be skilled in all use of equipment and materials used under the Contract.
      c. Be competent to troubleshoot and fix problems associated with Contractor provided materials.
      d. Have the test equipment, tools, and materials needed to troubleshoot and remediate problems associated with Contractor provided materials and installation.

C. The contractor shall not coordinate directly with the Owner or Consultant unless the General Contractor and Architect have given permission.

D. All coordination shall be documented in writing in a format approved by the Architect.
   1. Examples of coordination with the Owner are obtaining all the required IP addresses and finalizing camera fields of view.

E. All coordination shall be documented in writing in a format approved by the Architect.

F. Coordination of site walks, overheads, finals must be coordinated with the General Contractor and Architect with a minimum of five (5) business days' notice that a system is ready for review by the Consultant.

1.11 WARRANTY

A. The Contractor warrants to the Owner that all materials and equipment furnished under this specification will be new unless otherwise specified, and that all Work will be of excellent quality, free from faults and defects and in conformance with the specification. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

B. The Contractor warrants the materials, workmanship, and work to be in conformance with the Contract Documents included in this Project, for one full year from the approved substantial completion date unless a longer warranty or special guarantee is specified. Contractor shall assign to Owner all warranties and guarantees from or rights against any manufacturer, supplier or distributor of equipment, fixtures and other material installed in or incorporated in the Work at the time of Acceptance by Owner.
    1. Contractor Labor Warranty Period: One (1) year after date of Final Acceptance.
    2. Product Warranty Period: Ten years after the purchase date of equipment.

C. The Warranty binds the Contractor to correct any work that does not conform to such Contract Documents or any defects in workmanship or materials furnished under this Contract which may be discovered within the one-year period. The Contractor shall, at its own expense, correct such defect after receiving notice from the Owner by repairing same to the condition called for in the Contract Documents.

D. Contractor shall warrantee the repaired/replacement item for one year from date of repair/replacement. This warranty shall cover parts, labor, travel, and all other expenses.

E. All replacement, installation, integration, maintenance, and testing provided in conjunction with the warranty provisions of such contract will be provided at no additional cost to the Owner.

F. Additional Warranty
    1. Contractor will state any additional Contractor supplied warranty.

G. Contractor shall provide the Owner with a list of all contact information for warranty purposes to include phone numbers, email addresses and business and technical support hours.

H. All recall notices occurring during the manufacturer's warranty period will automatically be forwarded to the Owner.

I. All recall notices occurring after the expiration of the manufacturer's warranty will be forwarded to the Owner for a period of 2 years after the warranty expires.

J. Service Under Warranty
    1. The warranty service shall be on a 24-hour/day, 365-day/year basis with a response time not to exceed four hours. The respondent shall certify that its proposed service facility shall initiate, within one business day, on-site repair to any critical system product that fails while under warranty.
    2. Upon receipt of written notice, Contractor shall remedy defects within two calendar days, or the Owner shall seek other means to correct the defects and the Contractor, or its surety shall be liable for expenses.
    3. If it becomes necessary for the Owner to contract out for warranty repairs, due to an inability or failure of the Contractor to perform such repairs, the Contractor shall reimburse the Owner for all invoices for parts, labor, materials, travel, per-diem, and all other related expenses such as shipping/handling costs to perform such repairs, within 30 days from presentation of an invoice from the Owner. This shall only occur after the Contractor has been given two calendar days to respond and correct the problem. The cost limitation for such repairs will not exceed the actual costs as listed above which are related to the repair.

PART 2 - PRODUCTS

2.01 ACCESS CONTROL ENCLOSURES I/O BOARDS & PANELS

A. Acceptable Products:
    1. Avigilon AC-MER-CONT-2DR – Model LP1502 Mercury Intelligent Controller
    2. Avigilon Interface Modules AC-MER-CON-MR50-Mercury MR50
    3. Avigilon Interface Modules AC-MER-CON-MR52-Mercury MR52
    4. Avigilon Input Module AC-MER-CON-MR16IN-Mercury MR16IN

5. Avigilon Output Module AS-MER-CON-MR16OUT-Mercury MR16OUT

2.02 ACCESS CONTROL SYSTEM SOFTWARE

A. Avigilon Access Control Manager Enterprise Edition Version is currently being used by the Owner, incorporating Mercury Access Control hardware.

2.03 SURGE AND TAMPER PROTECTION

A. Acceptable manufacturers: Ditek
   1. DTK-MRJPOE
   2. DTK-TSS4D

B. 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-entry connection to components.

C. 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."

D. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements as recommended by manufacturer for type of line being protected.

E. Tamper switches shall be wired to each control panel door and be connected into the access control system for Owner monitoring purposes.
   1. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

2.04 AUXILIARY POWER SUPPLY

A. The following manufacturer is the Owner-standard for auxiliary power supplies:
   1. LifeSafety Power supplies or equivalent.

2.05 DOOR POSITION SWITCHES

A. Acceptable manufacturer for door position switches:
   1. UTC 1078/1076 DPDT series. DPS shall connect to the Access Control System and the Intrusion System contractor will also connect to this contact.
   2. DPDT contacts shall be placed at all roof hatch locations.
   3. UTC 2500 Series Wide Gap for Roll-up Door Locations if applicable.

2.06 DOOR RELEASE BUTTON

A. Acceptable manufacturer: United Security HUB series
   1. HUB3A - with momentary operation and screw terminal configuration.

2.07 CARD READERS

A. Acceptable manufacturer: HID
   1. Signo40 – Standard Profile Readers w/pigtail.
   2. Signo20 – Standard Profile -Mullion Readers w/pigtail.
   3. Signo40k – Card reader keypad at gate locations.

2.08 PEDESTAL FOR CARD READERS AT VEHICLE GATES

A. Acceptable manufacturer: Pedestal Pro
   1. Part #: 72-9C-D-72” Gooseneck pedestal
   2. HOOD-CS-04.5x6 Steel hood weather shrouds
   3. L-BOLT-625 L-Bolt mounting kit.

2.09 PEDESTAL FOR CARD READER AT PERSONAL GATES

A. Acceptable manufacturer: Pedestal Pro

1. Part #: 42-9c-BLK—42” Gooseneck pedestal
2. HOOD-CS-04.5x6 Steel hood weather shroud.
3. L-BOLT-625 L-Bolt mounting kit.

2.10 TRANSCORE READER EQUIPMENT AND LOCATION

A. Acceptable manufacturer: Transcore

B. Part Number: Encompass 4 PN# 10-4004-002

2.11 SECURITY POLE

A. Acceptable manufacturer: Strong poles
   1. Part number: SP-SM12S
   2. Include secondary handhole from manufacturer.
   3. Include concrete anchor bolt kit and leveling shims.

2.02 NEMA RATED ENCLOSURES

A. Provide and install a NEMA 4 rated enclosure on a Unistrut frame at vehicle gate locations.

B. Connect panels / controllers used at the gate locations to the main panels inside the MDF room.

C. Acceptable manufacturer: Nema Enclosures or equal

D. Doors shall be lockable, solid, powder coated carbon steel supported by the Unistrut frame. Unistrut and all installation hardware and all labor by security contractor. Conduit pathway from enclosure to gate, reader and facility by Div 26.

2.02 AUDIO/VIDEO INTERCOM STATIONS

A. Acceptable manufacturer: 2N IP Verso
   1. Part number: 01273-001
      a. 2N Info Panel 9155030
      b. Frame 01278-001,
      c. Box 01284-001
      d. Backplate 01293-001 (Flush Mount Box for Remote Station)

B. Each Audio/Video Station shall be programmed into the access control system. All entries granted through the 2N Station shall be recorded in the access control system’s activity log.

C. The contractor will consult the owner on the programming of the 2N station. The Contractor shall coordinate with the Owner on the IP phone location that shall connect to the 2N Door Station. The contractor will be responsible for all programming and shall meet the Owner’s specifications.
   1. For this project there will be a Owner furnished and intsalled phone in the reception area and in dispatch that shall have the capability to see the camera view and communicate with the door intercom station at the main entry. Coordinate set up with the owner. See drawings for locations of Owner provided phones.

D. Each 2N Video Intercom Station shall remain operational during network outages.

E. The contractor will test and operate the system a minimum of five times in the presence of the owner and consultant from each station location during the commissioning of the access control system.

2.03 WIRE AND CABLE

A. Minimum Specifications:
   1. All wire and cables shall be UL approved, meet all national, state, and local codes, and manufacturer’s recommendations for connected components for its intended application.
   2. Cable installed shall be rated for the environment in which they are installed.
   3. Insulation shall be rated for a minimum of 300 volts.
   4. Conductors shall be 100% copper.

5. Cables shall be shielded where required by equipment manufacturers.
6. Access control cable Acceptable Manufacturer:
   a. Belden, Windy City Wire or equal.

2.04 MISCELLANEOUS EQUIPMENT

A. The contractor will provide all necessary consumable materials and support hardware necessary to facilitate the installation of the system.

PART 3 - EXECUTION

3.01 SECURITY CABLE PATHWAYS AND SPACES

A. Wiring color codes will be strictly observed, and terminations will be uniform throughout the system.

B. Identification markings and systems will be uniform.

C. Existing surface mount conduits at any door location may be reused to access door frames or card reader locations.

D. All cables used throughout this project will comply with the requirements as outlined in the National Electric Code (NEC®) Articles 725, 760, 770, and 800 and the appropriate local codes.

E. Any cable installed in violation of the listed practices and additional guidelines in this specification shall be removed and the new cable installed at Contractor's expense.

F. Cable pathway
   1. All cable pathways in exposed ceiling and exposed areas of cloud ceiling environments, shall be concealed within conduit.
      a. Conduit and bushings shall be by DIV 26.
   2. Cable pathways above accessible ceiling shall be Mesh Cable Basket, Ladder tray or J-Hooks. Basket, ladder, and J-Hooks shall be by DIV 28.
   3. Conduits shall be free of debris prior to placing cable.
      a. Cable that is placed in conduits with debris shall be replaced at Contractor's sole expense.
      b. Contractors shall not install cables in any conduit prior to the installation of conduit bushings.
      c. Use of a split bushing will be accepted as indication the cabling was pulled through without the bushing being in place. The cables will be replaced at the Contractors cost for any area where this is discovered.
      d. Any anticipated delay in cable installation because of conduit or conduit bushing installation shall immediately be brought to the attention of the Owner Construction Manager and the Architect.
      e. All conduits must be free of debris prior to placing cable.
   4. The Contractor will observe the recommended bending radius and pulling strength requirements of the cable during handling and installation.
   5. Cable pathways shall remain continuous, free of splice points from the panel to the device.
   6. Cable pathways will avoid crossing over electrical rooms.
   7. Cable pathways shall not be parallel to electrical pathways without proper separation.
      a. All cables installed within ceiling spaces will be routed through these spaces at right angles to electrical power circuits.
   8. In suspended ceiling and raised floor areas where walker duct, cable trays or conduit are not available, the Contractor will bundle station wiring with hook-and-loop (Velcro) cable straps at appropriate distances.
   9. Cables shall not contact HVAC ductwork.

10. Cables shall not contact the building structural systems.
11. Cables will not be attached to lift out ceiling grid supports or laid directly on the ceiling grid. Cables will not contact ceiling grid support lines.
12. Cables will not be attached to or supported by fire sprinkler heads or delivery systems, or any environmental sensor located in the ceiling air space including duct work.
13. Cables will not come into direct contact with all thread. Areas where all threads come within six inches of the pathway will require the Contractor to place a manufactured split sleeve protection on all thread.
14. The Contractor shall not install any cable using pathways constructed or installed by other trades.
15. Contractors that violate these standards will be required to remove the cable at fault, correct the pathway and re-install the cable at Contractor's sole expense.
16. Every effort will be made to schedule the requirements under this Contract in such a manner to complete all above ceiling work prior to ceiling tile installation. In the event Contractor is required to remove ceiling tiles, such Work will not break or disturb grid and must be coordinated with the General Contractor.
17. The cable will be Underwriter's Laboratories (UL) listed type MPR, MPP, CMR, or CMP as stated in this specification document.
18. Conduit runs installed by the Contractor should not exceed one hundred feet or contain more than two 90-degree bends without utilizing appropriately sized pull boxes.
19. The Contractor will refer to the drawing for all device locations. All devices shown in the drawings will be considered monitored devices. All new or identified existing exterior doors shall receive a door position switch.
20. All cabling for the approved manufacturer's hardware must meet the factory specifications, including the requirements for cable that is stranded, twisted, with an overall shield to eliminate electrical interference.
21. Pair counts and wire gauge must meet the approved manufacturer's specifications based upon the distances and power level required.
22. Plastic tie wraps are not permitted at any time in the pathways. Contractors will use Velcro based ties to secure the cable bundles, if not already installed, in the conduit pathways.
23. All above ceiling cable installed for this system will be supported with conduit pathways secured to the building structural steel, walls, or by dedicated grid wire. Contractors will not share cable pathways with any other low voltage structured cable plant. All conduits by the electrical Contractor.
24. Any cables showing signs of excessive bending or mishandling that result in damage to the cable jacket will be replaced at Contractor's expense.
25. Cables will be installed for a non-plenum environment. All cable pathways shall be installed in conduit provided and installed by the electrical Contractor.
26. The Contractor shall provide new cable pathways with approved J-Hooks supported independently from the structure or walls and installed above the ceiling. The Owner will not accept any exposed wiring below the ceiling space for any reason. The electrical contractor shall provide and install new conduit pathways for all new door locations. Coordinate all pathway rough in with the site General Contractor and electrical Contractor and Owner prior to the rough in and installation of the door frames.

G. Fire Stopping
1. Fire stopping equipment and practices will comply with applicable national and local codes.
2. The sealing of openings between floors, through rated fire and smoke walls, existing or created by the Contractor for cable pass-through will be the responsibility of the Contractor.

3. Sealing material and application of this material will be accomplished in such a manner, which is acceptable to the local fire and building authorities having jurisdiction over this work.
4. The creation of such openings as are necessary for cable passage between locations as shown in the drawings will be the responsibility of the Contractor's work.
5. Any openings created by or for the Contractor and left unused will also be sealed as part of this work.

H. Contractor Responsibility
1. The Contractor will be responsible for damage to any surfaces or work disrupted because of this work. Repair of surfaces, including painting, will be included, as necessary.
2. The Contractor will rectify the damage caused at the Contractor’s sole expense.

I. Access control panels
1. Contractor will coordinate with the Owner on obtaining the proper I.P. address for the panel and panel labeling examples.
2. A dedicated data drop shall be run from the back of the patch panel to the wall mounted panel as needed. DIV. 27 shall provide the data drop for the access control system.
3. The Owner will plug in a patch cable from the patch panel to the switch to connect the access control panel on the network. Coordinate with the Owner on this process.
4. All access control panels shall have an 8 ½ by 11 laminated layout that has the following information placed inside the panel location. Contractor shall provide a mock-up of this document prior to deploying it inside the control panels.
    a. In the upper left corner of the layout provide the name of the installation company, phone number and Texas Security License number.
    b. In the upper right corner of the page provide the Name of the campus, the MDF or IDF room location.
    c. IP Address of the panel will be placed under the MDF / IDF room I.D., provide the subnet mask beneath the IP address.
    d. Place the gateway IP address information below the subnet mask.
    e. Place the service contract information (contact and phone number or just phone number will be acceptable)
    f. Provide a line diagram showing each blade location and the name of the device attached to each input on each card. Show this beneath the common information.
    g. All wiring shall be neatly dressed to each device input location and labeled within one inch of the termination at the input. Wiring includes all device communication and power.
    h. Wire all tamper switches on each control panel door back into the system.
    i. Label the battery and power supply location with the name of the campus, the MDF or IDF room location (MDF, IDF A etc) and the date on which the battery was installed. Labels shall consist of white backgrounds with black letters with a large font. Machine generated adhesive labels only. Nothing handwritten shall be acceptable. Coordinate with the Owner on the acceptable nomenclature.
5. The contractor will turn over all keys to all panels and to the electronic lockdown devices to the Owner following substantial completion. The General Construction Manager will coordinate transmittals.

J. Tamper Switches:
1. Provide a tamper switch to sense the opening of all security equipment enclosures.
2. Switch configuration normally closes when enclosure door is shut.

K. Electrical Power, Power Supplies, Auxiliary Power Supplies, and Batteries:

1. The contractor will provide and install a dedicated power supply for all panel locations. Coordinate with division 26 on the hard wiring of the power supply. The use of power cords or plug-in transformers for power supplies is not permitted.
2. Label the auxiliary battery and power supply location with the name of the facility, the MDF or IDF room location (MDF, IDF A etc.) and the date on which the battery was installed. Labels shall consist of white backgrounds with black letters with a large font. Machine generated adhesive labels only. Nothing handwritten shall be acceptable.
3. Provide as required auxiliary power supply(s) and battery backup, U.L. Listed, and labeled for access control systems. Battery backup shall be supplied for both the access control panel and the auxiliary power supply.
4. Provide low battery reporting as an integration into the access control system programming. Standby battery operation time shall equal, or exceed, the standby operation time of the main panel; in any case, provide a minimum of 12-amp hours battery backup.
5. Provide a U.L. Listed cabinet suitable for surface mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and a painted standard finish. The back box and door shall be constructed of 0.060" minimum steel with provisions for electrical conduit connections into the sides and top. The cabinet shall provide storage for backup batteries. The door shall provide a key lock to access system components, key alike with main panel. The cabinet shall be attack resistant and fitted with front and back tamper switches. All components shall be securely mounted, and all cable routed, and tied wrapped in a neat, professional manner.
6. All cables will route via conduit pathways connecting the main power supply to the main alarm panel location. Placement of this sleeve is the responsibility of the Contractor.
7. Division 26 shall provide power through a 120 VAC, 20-ampere breaker.
8. All electrical wiring shall be done on terminal strips – no wire nuts or caps are permitted at any time on any panel.
9. Label the location of the circuit and electrical panel supporting the power supply inside the power supply cabinet and inside the access control cabinet.

L. Door position switches
1. Reference drawings for door position switch locations. Use flush mounted door contacts positioned at the top of each door for all new door locations as indicated on the drawings.
2. Use surface mounted door contacts for all other door locations and roof hatch locations.
3. The devices will be programmed to show door / hatch open / closed and door / hatch ajar or held open alarm events.

M. Request to exit.
1. Reference the drawings for all door locations with RTE devices. These devices shall be provided by division 8 and wired into the access control system by the contractor.
2. The Contractor will wire the RTE device from the hardware device through the door to the EPT transfer device or other approved pathway and into the access control panel.
3. Coordinate with division 8 door hardware and division 26 electrical prior to hardware installation.

N. Card readers
1. The Contractor shall use new conduits and back boxes provided and installed by the electrical Contractor at each reader location. Reference drawing for all reader locations.
2. The security Contractor shall seal all exterior mounted reader locations with a clear UV resistant sealant to prevent insect or water damage.
3. Silicon will dry clear and must be UV resistant.

4. Route the wiring to the nearest access control panel in the installed pathway provided by the electrical Contractor.

O. Door release buttons
1. The contractor shall provide and install a surface electronic lock button that will release the personnel door leading from the vestibule to the office when activated.
2. The button shall be located underneath the receptionist desk. A concealed pathway to the desk from the ceiling will be provided by the electrical Contractor.

P. Audio/Video Intercom Stations:
1. Contractor shall provide as indicated on the drawings and integrate with the access control system and VMS software to record all transactions.

Q. Tolltag reader
1. The Contractor shall verify the readers can read the tags on both low-profile vehicles and busses that are equipped with toll tags.
2. Gate reader mounting – The reader shall be mounted on a square steel pole with the pole mounting bracket, reference technology drawings for locations. The reader shall be mounted 10 feet above the existing road.
3. Follow manufacturer's recommended distances so that all approaching vehicles will be detected as they turn into the driveway approaching the gate.

R. Labeling
1. System components and wiring shall be comprehensively labeled.
2. All labels shall be machine generated adhesive wrap around labels.
3. Handwritten labels are not acceptable.
4. Labeling shall be installed within six inches of termination inside the panel.

3.02 PROGRAMMING

A. Before installation of the system, the Contractor shall coordinate with the Owner for the following:
1. System network settings, including IP addressing, VLANs, firewall ports, et.al.
2. Password provisioning plan. No devices shall be deployed using their manufacturer default passwords.
3. An asset management worksheet, to include:
   a. Manufacturer, model of the panel.
   b. Device logical names for each panel as provided by Owner.
   c. Serial number and MAC address of each controller, if applicable
   d. Network settings, including IP address, VLAN or subnet mask, default gateway as provided by Owner.
   e. Equipment location (Which communication space is the panel located in)
   f. Device usernames and passwords

B. The Contractor and its authorized installers shall ensure only secure versions of all protocols are used, including HTTPS, SFTP, SNMPv3

C. Include any licensing requirements or fees for using the management software and accompanying client software.

D. Integration with Owner surveillance system. The contractor shall provide sufficient license fees as needed to incorporate the cameras into the access control system.
1. Provide operational programming support.
2. Contractor shall ensure all portal licenses meet the requirements of the current facility design and upgrade the software as required. The system must be able to report the programmed alarm events through various means of communication including email, SMS text and through the client software.

3. Include any licensing requirements or fees for all device components added to the system.
4. Program all new devices, panels, and controller locations into the system.
   a. Program each panel and program into the network.
   b. Include all necessary IP addresses and VLAN configurations will be provided by the Owner's technology department.
   c. All inputs, outputs, card readers, locks, card reader groups, portal group's access levels shall be set in coordination with the Owner.
   d. Integration with Active Directory – coordinate with the Owner prior to start of work. This will include setting up automatic updates from Software (used by the Owners technology department).
   e. Load all user data into the database as directed by the Owner.
   f. Credential permissions. Coordinate with Owner.
   g. Owner Programming
      1) Time schedule and time schedule groups will be set up by the Owner.
5. It will be the responsibility of the contractor to obtain the electronic copies of the floor plans from the architect through the Owner's Representative for the creation of the facility map.
   a. Facility floor plans shall be created for each building and shall show the following status changes at all monitored door locations.
   b. All monitored door location statuses, closed, open, forced, held open.
6. The Owners' personnel will monitor the system. The contractor will set up the system to provide email and SMS messaging to the required parties during the programming phase of this project.
7. Follow all manufacturer guidelines for protecting the Owner's network from cyber-attacks. Reference the most recent version of following manufacturer hardening guides for best cyber security practices prior to installation of new devices on the Owner's network.

B. Intrusion alarm interoperability
1. Contractor shall connect the access control system to the intrusion alarm system. A valid card read from the exterior of the building shall disarm the intrusion alarm system for the entire building.
2. Contractor shall also install card readers adjacent to the intrusion detection system keypads at locations shown in the drawings. Contractors shall provide all components and wiring from the reader to the intrusion alarm panel in the MDF room to allow an authorized user to arm the system when a credential is presented. The IDS contractor shall connect the wiring to the proper input / output on the IDS and program the IDS to arm the system.

3.03 TESTING AND FINAL ACCEPTANCE

A. A factory-trained representative of the manufacturer shall supervise the final connections and testing of the system, and it shall be subject to the final acceptance of the Architect, Representative, and Owner.

B. The access control Contractor shall make a thorough inspection of all device locations to ensure the following:
1. Confirm all devices are properly located and connected as per the Security drawings, construction specification documents and manufacturer's best practices or installation instructions for a complete and functional system.

C. The integrator will perform on-going reviews of all work for compliance with the contract documents with a representative from the Architect. Work not found in compliance with the contract documents will be corrected at the contractor's cost.

D. Final acceptance will not be given until all locations installed in the field are verified on the Contractors close out record drawings and the functionality and programming verified by the Owner the Consultant and the Contractor.

END OF SECTION

SECTION 28 2300
VIDEO SURVEILLANCE SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Related Documents: Division 00 – Procuring and contract documents, General and Supplementary Conditions of the Contract, Division 01 General Requirements.

B. 28 0511 Cyber Security Requirements.

C. 28 1300 Access Control.

D. Manufacturer Cyber Security Guidelines.

1.02 SUMMARY

A. Section includes:
1. Provide and install a new surveillance system for the new facility to include new cameras, licensing, and mounting hardware with programming work and new video storage for the facility.
2. The structured cable plant to all camera locations will be provided by Div. 27.
3. The Owner will provide the data network hardware capable of supporting the cameras with Power over Ethernet.
4. All final placement and camera views shall be verified and approved by the Owner prior to final acceptance.

B. Related Requirements
1. TIA 569 C– Telecommunications Pathways and Spaces
2. ANSI/TIA/ 606-B – Administration Standard for Commercial Telecommunications Infrastructures
3. ANSI/TIA-862-A – Building Automation Systems Cabling, published 2011.
4. International Standards Organization/International Electro Technical Commission (ISO/IEC) DIS 11801, second Addition, 2002 – 2009.
5. International Standards Organization (ISO) 7816
6. Underwriters Laboratories (UL®) Cable Certification and Follow up Program
7. National Electrical Manufacturers Association (NEMA)
8. American Society for Testing Materials (ASTM)
9. National Electric Code (NEC®), Latest Issue
10. Institute of Electrical and Electronic Engineers (IEEE)
11. UL Testing Bulletin

1.03 DEFINITIONS

A. FOV: Field of view

B. FTP: File transfer protocol.

C. IP: Internet protocol.

D. LAN: Local area network.

E. TCP: Transmission control protocol - connects hosts to the Internet.

F. UPS: Uninterruptible power supply.

G. WAN: Wide area network.

1.04 PERFORMANCE REQUIREMENTS

A. The Contractor shall provide and pay for all materials, supplies, machinery, equipment, tools, superintendence, labor, services, insurance, and all water, fuel, transportation, and other facilities necessary for the execution and completion of the work covered by the Contract Documents.

B. Unless otherwise specifically provided in this Contract, all equipment, material, and articles incorporated in the work covered by this Contract are to be new and of the most suitable grade for the purpose intended.

C. All work under this Contract shall be performed in a skillful and professional manner. The Contractor agrees to employ only orderly and competent employees, skillful in the performance of the type of work required under this contract; and agrees that whenever informed by the Owner in writing that any employee(s) on the work is (are), in its opinion, incompetent, unfaithful or disorderly, shall be discharged from the work and shall not again be employed on the work without the Owner's written consent.

D. Materials or work described in words, which so applied, have a well-known technical or trade meaning shall be held to refer to such recognized standards. Neither custom nor usage of trade shall require the Owner to accept materials or workmanship not in strict and complete compliance with the Contract Documents.

E. The Owner makes no representations as to the accuracy or completeness of the site information furnished to the Contractor by the Owner and does not expressly or impliedly warrant same and is not responsible for any interpretations or conclusions reached by the Contractor with respect thereto. It is Contractor's sole responsibility to verify to its own satisfaction all site information.

F. The Contractor is responsible for having visited the site and ascertained pertinent local conditions such as location, accessibility, and character of the site or building, the character and extent of existing work within and adjacent to the site, and any other work being performed thereon at the time of the submission of his proposal. Any failure to do so will not relieve him of responsibility for successfully performing the work without additional expense to the Owner.

G. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported to the Owner at once.

H. If in the performance of the Contract, subsurface, latent, or concealed conditions at the site are found to be materially different from the information included in the specification and the resulting Contract Documents, or if unknown conditions of an unusual nature are disclosed differing materially from the conditions usually inherent in work of the character shown and specified, the Owner shall be notified in writing of such conditions before they are disturbed. A/E, with the approval of the Owner, will promptly make such changes the Specifications as deemed necessary to conform to the different conditions, and any increase or decrease in the Work, or in the time within which the Work is to be completed, resulting from such changes will be adjusted by Change Order subject to the prior approval of the Owner.

I. Before submitting its proposal to the Owner, and continuously after execution of the Contract, the Contractor shall carefully study and compare this specification and shall at once report to the Owner any error, inconsistency, or omission the Contractor may discover, including any requirements which may be contrary to any law, ordinance, rule, regulation, or order of any public authority bearing on the performance of the work. By submitting its proposal for the Contract and the Work, the Contractor agrees that the specification and resulting Contract Documents appear accurate, consistent, and complete as far as can be

determined. If the Contractor has reported in writing an error, inconsistency, or omission, has promptly stopped the affected work until otherwise instructed, and has otherwise followed the instructions of the Owner, the Contractor shall not be liable to the Owner for any damage resulting from any such errors, inconsistencies or omissions in this specification and resulting Contract Documents. The Contractor shall perform no portion of the Work at any time without the Contract Documents and, where required, approved Project Drawings, Product Data or Samples for such portion of the Work.

J. The Contractor shall perform the Work in accordance with the Contract Documents and submittals.

K. The Contractor shall arrange for the securing of all necessary permits and pay for same.

1.05 CONTRACTOR QUALIFICATIONS

A. Acceptable Manufacturers
   1. Avigilon

B. Contractor
   1. Bidders who do not currently possess the necessary qualifications, trained and experienced personnel, financial capacity, current state licenses (as required by the Texas Department of Public Safety Private Security Bureau), and meet the other requirements herein described will be disqualified.
   2. The Contractor, as a business entity, shall be an authorized and designated representative/Dealer of the equipment used in this specification, with full warranty privileges, and shall have been actively engaged in the business of selling, installing, and servicing surveillance systems for a period of at least three (3) years The Contractor, as a business entity, shall have successfully installed a minimum of three similar-sized systems that are currently operating to the Owner's satisfaction.
      a. Integrators must be certified by the manufacturer to bid on this work.
         1) Contractors who are in the process of becoming certified with the specified manufacturer may not be selected.
   3. The preferred Contractor will have a minimum of five (5) years of surveillance / video management system installation experience with K-12 schools in Texas.
   4. The Contractor will comply with all federal, state, and local statutes regarding qualifications of firms.
   5. The Contractor will have adequately trained personnel in the usage of such tools and equipment and will provide a quantity of certified technicians as part of their submittal response.
   6. The Contractor must have previously established offices located within 120 miles of the Owner's Administration Building.
   7. The Contractor shall not have any grievances or complaints of record regarding workmanship, code compliance or service response. A Contractor that has any prior finding(s) of a license violation or has any litigation in process is unacceptable.
   8. The Owner reserves the right to reject bid of any bidder who has previously failed to perform properly, or complete on time, contracts of a similar nature.

C. Subcontractors
   1. The use of qualified sub-Contractors to an unqualified security Contractor for this project is not approved.

1.06 SUBMITTALS

A. No portion of the work shall commence, or equipment ordered until the architect, consultant, and engineering team (A/E) and Owner have approved the submittals.

B. Successful Contractor shall submit an electronic PDF copy of the submittal package within 15 days of written notification to proceed or other written documentation from the Architect or General Contractor. Documents shall be broken by the following:

C. Action Submittals
   1. Provide manufacturers cut sheets for each piece of equipment specified. Include the manufacturer name, model number and description of each listed component.
      a. In cases of multiple product numbers on a single cut sheet, the Contractor shall identify the proper part number with a cloud or highlight.
   2. Shop drawings are required for the submittal package and will contain the following information:
      a. Indicate the location of each device as it appears inside or outside the building. Devices shall include all camera locations and mounting types and other devices associated with the video surveillance system.
      b. Each device shall be labeled as per the direction of the Owner representative.
      c. Title blocks used on all drawings will be those of the Contractor and shall include the following:
         1) Company name,
         2) Company address and phone number for service.
   3. Provide an Excel spreadsheet containing the following information:
      a. Campus Name
      b. Camera Name (as coordinated with the Owner)
      c. Camera Manufacturer and Model Number
      d. IP Address (obtained from the Owner)
      e. MAC address of each camera (from the manufacturer)
         1) The Owner requires all MAC addresses prior to installation of devices. Submit this information through the general Contractor for the attention of the Owner prior to the transmittal of the submittal documents.
   4. No portion of the work shall commence, or equipment ordered until the architect, Owner Representative and Owner have approved the submittals.

D. Informational Submittals
   1. Provide a copy of current manufacturer's certifications for the company and for all personnel who will provide services on this project.

E. Closeout Submittals
   1. Contractor shall be furnished with either a set of CAD files or the Revit model to use for record drawings.
   2. Maintenance Data: Include manufacturers' operating instructions, original copies of all software, recommended maintenance required and maintenance intervals.
   3. A complete parts list of additional materials provided as attic stock – if applicable.
   4. Drawings
      a. Update the original submittals of the floor plans. Relocate any device that may have been moved or altered during the life span of the project.
      b. Each device shall be labeled as per the direction of the Owner representative.
      c. Update the line diagram drawings provided during the submittal phase that indicate device locations back to the communication spaces (MDF/IDF). This will include any changes to the camera numbering or locations.
      d. Identify the type of camera by its Manufacturer and Model
      e. Identify the camera name determined through coordination with the Owner.
   5. Drawings will contain the contractors' own title block on the edge of the drawing. The title block shall contain the following information and adhere to the following requirements.
      a. Company name
      b. Company address and phone number for service

c. Date on the drawings will match the date of acceptance for warranty purposes
d. Do not use any part of the consultant / architect title block, copyright data or seals. Failure to remove these items will result in the document being returned stamped revise and resubmit.

6. Drawings will be issued in PDF format.
7. Provide all drawings in black and white. Do not provide electronic drawings in color.

F. Drawings shall be provided to the A/E for review and acceptance prior to the Owner's final acceptance of the project.

1. The drawings will be reviewed with the A/E and the Owner prior to the final acceptance process. Drawings rejected for any reason will delay the final acceptance process until resolved.
2. Completed record drawing will be required for use during the final acceptance process of the construction project. Failure to produce the record drawing during this process will result in a delay in the final acceptance of the project.

1.07 QUALITY ASSURANCE

A. Contractors shall have a documented quality assurance program. This program shall have internal inspection team(s) to measure the service and product quality produced by the Contractor's technicians against internal and Industry standards.

1.08 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of the delivery storage and handling specification sections in the project specification book.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Stored materials shall be protected from exposure to harmful environmental conditions and at temperature conditions recommended by manufacturers.

D. Handle products and systems in accordance with manufacturer's instructions.

E. Contractors are required to remove all empty containers and other trash associated with the system. This includes all packaging, excess cable and other materials that hold no value to the Owner.

1.09 PROJECT CONDITIONS

A. Project Environmental Requirements

1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
2. Do not begin installation until instructed to perform by the Owner Construction Manager at Risk.
3. While on campus or on any land owned by The Owner all Contractors will comply with Owner policies concerning alcohol, tobacco, and firearms as well as any other Owner policy governing dress, behavior etc.

1.10 COORDINATION

A. Single Point of Contact / Project Manager

1. Contractor shall provide a single point of contact, i.e., Project Manager, to speak for the Contractor and to provide the following functions:
   a. Initiate and coordinate tasks with the Owner Technology Projects Manager, its General Contractor, Architect, and others as specified by the Architect or General Contractor.
   b. Provide day-to-day direction and on-site supervision of Contractor personnel.
   c. Ensure conformance with all Contract provisions.

2. If the Project manager is unable to remain continuously on site a project, Forman shall be required to remain. The project supervisor shall be responsible for day-to-day activities and reporting all status to the Project Manager.

B. Technical Support
   1. Contractor shall provide technical support consisting of two technicians for a full working day when Owner deems necessary during the physical move to the site.
   2. The personnel providing technical support shall:
      a. Have intimate knowledge of the system and materials that were used.
      b. Be skilled in all use of equipment and materials used under the Contract.
      c. Be competent to troubleshoot and fix problems associated with Contractor provided materials.
      d. Have the test equipment, tools, and materials needed to troubleshoot and remediate problems associated with Contractor provided materials and installation.

C. The contractor shall not coordinate directly with the Owner or Consultant unless permission has been given by the General Contractor and Architect.

D. All coordination shall be documented in writing in a format approved by the Architect.
   1. Examples of coordination with the Owner are obtaining all the required IP addresses and finalizing camera fields of view.

E. All coordination shall be documented in writing in a format approved by the Architect.

F. Coordination of site walks, overheads, finals must be coordinated with the General Contractor and Architect with a minimum of five (5) business days' notice that a system is ready for review by the Consultant.

1.11 WARRANTY

A. The Contractor warrants to the Owner that all materials and equipment furnished under this specification will be new unless otherwise specified, and that all Work will be of superior quality, free from faults and defects and in conformance with the specification. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

B. The Contractor warrants the materials, workmanship, and work to be in conformance with the Contract Documents included in this Project, for one full year from the approved substantial completion date unless a longer warranty or special guarantee is specified. Contractor shall assign to Owner all warranties and guarantees from or rights against any manufacturer, supplier or distributor of equipment, fixtures and other material installed in or incorporated in the Work at the time of Acceptance by Owner.
   1. Contractor Labor Warranty Period: One (1) year after date of Final Acceptance.
   2. Product Warranty Period: Ten years after the purchase date of equipment.

C. The Warranty binds the Contractor to correct any work that does not conform to such Contract Documents or any defects in workmanship or materials furnished under this Contract which may be discovered within the one-year period. The Contractor shall, at its own expense, correct such defect after receiving notice from the Owner by repairing same to the condition called for in the Contract Documents.

D. Contractor shall warrantee the repaired/replacement item for one year from date of repair/replacement. This warranty shall cover parts, labor, travel, and all other expenses.

E. All replacement, installation, integration, maintenance, and testing provided in conjunction with the warranty provisions of such contract will be provided at no additional cost to the Owner.

F. Additional Warranty
   1. Contractor will state any additional Contractor supplied warranty.

G. Contractor shall provide the Owner with a list of all contact information for warranty purposes to include phone numbers, email addresses and business and technical support hours.

H. All recall notices occurring during the manufacturer's warranty period will automatically be forwarded to the Owner.

I. All recall notices occurring after the expiration of the manufacturer's warranty will be forwarded to the Owner for a period of 2 years after the warranty expires.

J. Service Under Warranty
   1. Warranty service shall be on a 24-hour/day, 365-day/year basis with a response time not to exceed four hours. The respondent shall certify that its proposed service facility shall initiate, within one business day, on-site repair to any critical system product that fails while under warranty.
   2. Upon receipt of written notice, Contractor shall remedy defects within two calendar days, or the Owner shall seek other means to correct the defects and the Contractor, or its surety shall be liable for expenses.
   3. If it becomes necessary for the Owner to contract out for warranty repairs, due to an inability or failure of the Contractor to perform such repairs, the Contractor shall reimburse the Owner for all invoices for parts, labor, materials, travel, per-diem, and all other related expenses such as shipping/handling costs to perform such repairs, within 30 days from presentation of an invoice from the Owner. This shall only occur after the Contractor has been given two calendar days to respond and correct the problem. The cost limit for such repairs will not exceed the actual costs as listed above, which are related to the repairs.

PART 2 - PRODUCTS

2.01 CONTROL AND NETWORK CABLES

A. Horizontal cabling and copper patch cords shall be provided and installed by DIV 27. This will include the horizontal cable, the faceplates, inserts and copper patch cables required for each location and all cabling needed for surveillance locations on the light poles if applicable.

B. The Contractor shall connect the patch cable to the back of each camera installed in this project.

2.02 INTERIOR CAMERAS SINGLE FIXED SENSOR

A. Acceptable manufacturer: Avigilon
   1. Indoor Dome 6.0C-H5A-D1 – 6 MP Dome Camera

2.03 EXTERIOR CAMERAS SINGLE FIXED SENSOR

A. Acceptable manufacturer: Avigilon
   1. Exterior Wall Mounted Dome - 6.0C-H5A-DO1-IR
      a. All exterior cameras shall be equipped with IR illuminators.

2.04 MULTI-SENSOR QUAD VIEW AND FISHEYE CAMERAS

A. Acceptable manufacturer: Avigilon
   1. Fisheye – Interior for acoustical ceilings
      a. 12.0W -H5A-FE-DC1
   2. Fisheye – Interior for wood or plaster ceilings
      a. 12.0W-H5A-FE D1
   3. 180 Degree Multi-Sensor

a. (3X5) 15C-H4A-3MH-180
b. Pendant Wall Mount – IRPTZ-MN-WALL1
c. IR Illuminator – H4AMH-AD-IRIL1 for use with H4AMH-DO-COVR1

4. 270 Degree Multi-Sensor
   a. (3X8) 24C-H4A-3MH-270
   b. NPT Adapter # IRPTZ-MT-NPTA1
   c. Corner Mount – H4-MT-CRNR1
   d. IR Illuminator – H4AMH-AD-IRIL1 for use with H4AMH-DO-COVR1
   e. Use of seal tight for pathway connections from camera housing to exterior back box will be the responsibility of the Contractor.
5. 360 Degree Multi-Sensor - 32C-H4A-4MH-360
   a. NPT Adapter IRPTZ-MNT-NPTA1
   b. Pole Mount Bracket– H4-MT-POLE1
   c. Pendant Wall Mount – IRPTZ-MN-WALL1
   d. IR Illuminator – H4AMH-AD-IRIL1 for use with H4AMH-DO-COVR1

2.05 LICENSING

A. The Contractor is responsible for providing all required licenses for each camera being added to the system.
   1. Avigilon xC-ACC7-ENT series
   2. All camera and software licenses and accompanying software will be transferred to the Owner.

2.06 STORAGE

A. Video storage shall be provided and installed by the contractor. Coordinate with the Owner on location of video storage.
   1. Acceptable manufacturer: Avigilon
      a. 1 each NVR5-PRM-224TB-S19
         1) 224 TB (288 TB Raw) NVR5 Premium with Microsoft Windows Server 2019 LTSC and Avigilon Control Center
      b. 2 each NVR5-SFPPLUS-DA

B. Contractor shall provide Avigilon xC-ACC7-ENT series Enterprise licensing packages for all camera channels as required and unlimited client connections. Every new camera requires a camera license, purchased by the contractor.

C. Contractor shall include all necessary fees for one year of maintenance coverage for each camera in the project. The year will begin at the Owner's approved substantial completion date and not on the date of purchase by the contractor.

D. At no time will the contractor discuss any set up, programming, or coordination with any member of the Owner without approval from the Owner. All questions and coordination requests will be routed through the architect in writing until such a time that the Owner deems necessary.

2.07 MISCELLANEOUS EQUIPMENT

A. The Contractor will provide any necessary Velcro, J-Hooks, and support hardware, etc., necessary to facilitate the installation of the System.

2.08 TRAINING

A. No training is required.

PART 3 - EXECUTION

3.01 SECURITY CABLE PATHWAYS AND SPACES

A. All cabling installed for this system will be installed by the Div. 27 Contractor and shall be supported with J-Hooks secured to the building structural steel or by dedicated all thread rods or in conduit installed by Div. 26.

B. Wiring color codes will be strictly observed, and terminations will be uniform throughout the system.

C. Identification markings and systems will be uniform with machine generated labels.

3.02 DEVICE INSTALLATION

A. All ceiling mounted camera locations shall be supported from the structure at industry standard intervals for the size specified, utilizing proper anchoring devices and techniques for each type of camera mount used. Do not support camera devices from the drop ceiling grid wire or on the ceiling tiles.

B. Interior cameras Interior cameras mounted to sheet rock should use (qty 3) steel self-drilling drywall anchors.

C. All exterior security cameras will be properly secured to the sides of the exterior wall at the locations shown on the technology drawings. Plastic anchors will not be accepted at any exterior mount location.

D. Corner mount cameras shall be installed with flexible seal tight conduit from the camera housing to the back box for cable pathway support. All seal tight shall be the responsibility of the Contractor.

E. Conduit and sleeve penetrations through the outer wall for security cameras will be provided and installed by Div 26. The electrical Contractor shall be required to provide protective plastic bushings, colored, white, placed at the ends of the conduit sleeves prior to pulling in any cabling to the camera. Do not install cables in conduit sleeves that are not equipped with bushings.

F. Tour site with the representative from the Owner and verify field conditions at locations shown on drawing. Do not place cameras in final locations where field of view objectives cannot be met. Confer with the Owner and Architect on final placement of cameras where necessary. Cameras installed in obstructed areas shall be relocated at Contractor cost.

G. Position cameras to avoid direct light sources and extreme backlit situations shadowing as much as possible. Orient camera for best image and adjust as required.

H. Seal all exterior cameras, including those under roof, with clear RTV or silicon sealant at locations where mounting contacts wall surface.
   1. Sealant will be rated for UV protection using clear sealant.

I. Acrylic domes and windows shall be treated after installation with approved plastic cleaner and polish. All domes will be cleaned prior to final acceptance.

J. Contractor will allow the Owner two calendar weeks of use and will then return to adjust camera angles and views as directed by an authorized Owner representative. Contractor will coordinate this visit through the Owner construction representative.

3.03 PROGRAMMING

A. Before installation of the system, the Contractor shall coordinate with the Owner for the following:
   1. System network settings, including IP addressing, VLANs, firewall ports, et.al.

2. Anti-virus, anti-malware and other prevention and detection tools on servers and client machines
3. Operating system versions and patch levels on servers and client machines
4. Needs and methods for allowing remote access
5. Password provisioning plan. No devices shall be deployed using their manufacturer default passwords.
6. An asset management worksheet, to include:
    a. Manufacturer, model, and firmware or software version
    b. Device logical names
    c. Serial number and MAC address, if applicable
    d. Network settings, including IP address, VLAN or subnet mask, default gateway
    e. Equipment location
    f. Device usernames and passwords

B. The Contractor and its authorized installers shall:
1. Complete the Owner-approved asset management worksheet.
2. Synchronize security devices with a common time base acceptable to the Owner.
3. Disable all services and ports not required for ongoing system operation, including ICMP and discovery protocols (subject to Owner's standards).
4. Provision device and system privileges in a manner approved by the Owner.

C. Ensure only secure versions of all protocols are used, including HTTPS, SFTP, SNMP v3.

D. Analytic configurations shall be by Owner.

E. Contractor shall install the IP address to each camera location as provided by Owner.

F. Contractor shall name each camera as directed by the Owner.

G. Contractor shall finalize all camera view angles and coverage areas with the Owner prior to final acceptance.

H. Reference closes out requirements in section one of these specifications for additional requirements.

3.04 TESTING AND FINAL ACCEPTANCE

A. A factory-trained representative of the manufacturer shall supervise the final connections and testing of the system, and it shall be subject to the final acceptance of the Architect/Engineer and Owner.

B. The Security Camera Contractor shall make a thorough inspection of all camera locations to ensure the following:
1. Confirm all devices are properly located and connected as per the technology drawings and the construction specification documents for a complete and functional system.
2. Installed in accordance with manufacturer's instructions.
3. Viewing angles and images approved by the Owner.

C. The personnel providing technical support during final acceptance process will:
1. Have thorough and in-depth knowledge of the System and Materials that were used as well as have direct project experience.
2. Be skilled in all use of equipment and materials used under the Contract.
3. Be competent to troubleshoot and fix problems associated with Contractor provided materials.
4. Have proper tools, ladders etc to support on site correction at the direction of the Owner, Consultant or Architect.

D. Labeling

1. System components and wiring shall be comprehensively labeled.
2. All labels shall be machine generated.
3. Handwritten labels are not acceptable.
4. Do not place the IP addresses for the cameras on the outer domes or anywhere else the public can see them.

E. The Project Manager and/or Manufacturer System Manager will perform on-going inspections during construction with a representative from the Architect. All work will be performed in a high-quality manner and the overall appearance will be clean, neat, and orderly.

F. The following is a partial list of items that will be examined and will comply satisfactorily in all instances.
   1. Is the design documentation (closeout) complete to include hard copy drawings of all camera locations?
      a. Cameras will be properly named in the final documents.
      b. All locations and camera types are properly shown as they relate to the installed product locations.
      c. Correct title block is being used on the drawings.
   2. Has Contractor worked with the Owner directly to test the system to ensure it is properly reporting and identifying all events properly?
   3. Has the floor plan been set up in the management software and does it show all camera locations as requested by the Owner?
   4. Are all cameras properly named as per the Owner’s direction and coordination?

END OF SECTION

SECTION 28 4600

FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SCOPE

A. The Contractor shall furnish all equipment, materials, labor, supervision, and services necessary for, or incidental to, the installation, programming, configuration and testing of fire alarm systems in the new building, as indicated on the drawings and/or specified herein. Fire alarm system shall be digital protocol analog addressable system with integrated emergency communication system capabilities. Contractor shall be aware that the drawings are not all conclusive. The following significant items are not indicated on the drawings, but are required fire alarm work:

1. 120 volt power circuits for fire alarm
2. Air handling units in excess of 2000 cfm and associated duct smoke detectors
3. Smoke dampers
4. Booster or expander panels

B. Provide all required sprinkler tamper switches, valves, etc., required for proper connection to the sprinkler system.

C. Fire alarm system shall include combination ADA voice evacuation type speaker/strobe units throughout the project.

D. All required devices might not be shown on the drawings. The Fire Alarm Contractor shall thoroughly review the contract documents before bidding to assure himself that all required “ADA” horn strobe units and fire alarm devices have been included. Contractor shall furnish and install all required devices whether indicated on not.

E. Provide all required devices and connect all kitchen hoods and fire suppression systems to the fire alarm system as required.

F. Where a requirement within this specification is more stringent than a similar requirement within a code or standard, the specification requirement shall take precedence. This specification may be changed only with written directive.

G. Smoke detectors for smoke dampers and A/C units rated greater than 2000 cfm are not shown on the drawings. Refer to Mechanical Drawings for quantity and location of these devices. Refer to Paragraph – ADDRESSABLE DUCT-MOUNTED SMOKE DETECTORS for additional information.

H. Comply with all Fire Codes of the Authority Having Jurisdiction (AHJ). All bidders are expected to be knowledgeable with all fire code requirements.

1.03 QUALITY ASSURANCE

A. Provide the Owner's Representative with:

1. Manufacturer's certificate showing materials meet or exceed the minimum requirements specified and indicating that manufacturer has ISO 9002 approval.

2. Provide a copy of installing company's license to sell and install fire alarm systems in the State of Texas in the submittal package.

3. Provide a copy of job Fire Alarm System Planning Superintendent's license for installation of fire alarm systems in the State of Texas in the submittal package. Superintendent shall be a full-time employee of Fire Alarm Contractor.

4. Shop drawings and wiring diagrams with equipment counts and locations submitted to the Owner's Representative and the local authority. Shop drawings shall include the following:

   a. Conduit layout
   b. Wiring and device layout in color for entire facility
   c. Riser diagram with all equipment and devices
   d. Full size CAD drawings in Autocad 2013 or later format.
   e. Battery calculations for emergency back-up of the entire system.

5. A copy of the installing company’s letter stating that they have thoroughly reviewed the Contract Documents prior to bidding and have notified the Engineer of any omissions or inconsistencies discovered.

6. Fire alarm technicians that are Level 3 NICET Certified shall supervise installation of all wiring and devices. Provide Technician’s License who will supervise the installation, and will be on the project at all times during Fire Alarm Inspection.

7. Letter from Silent Knight stating that the Contractor is a factory-trained distributor for the Farenhyt IFP-300 and factory authorized distributor for the area where the project is located.

1.04 REFERENCE STANDARDS

A. Except as modified by this Specification, conform to the applicable provisions and recommendations of the following standards:

1. National Electrical Code (NEC)
2. Underwriters' Laboratories, Inc. (UL)
3. International Building Codes (IBC)
4. International Fire Code (IFC)
5. National Fire Protection Association 72

6. National Fire Protection Association 101 Life Safety Code
7. Americans with Disability Act (ADA) – State and National
8. Texas Accessibility Standards (TAS)
9. BICSI Wiring Standards
10. Local and State Building Codes
11. All requirements of the Local Authority Having Jurisdiction (AHJ)

1.05 SIGNAL TYPES (SYSTEM STATUS)

A. General: The fire alarm control panel shall indicate various conditions or signals depending on system inputs. In all instances, a more severe signal shall override all less severe signals. All events are to be recorded with time and date in an electronic event history log maintained by the fire alarm control panel. The following is a short description of conditions that the fire alarm control panel is required to indicate in the order of severity:

1. Waterflow Fire Alarm: A waterflow signal is a special alarm condition that is only applicable when an automatic building sprinkler or similar system is monitored. It indicates that a least one sprinkler head is open, so in addition to a fire the premise is subject to water damage. This signal is transmitted on a special channel on the digital communicator. This is a fire alarm condition and all actions listed under fire alarm shall take place.

2. Fire Alarm: The alarm signal is indicative of fire. Such a signal indicates an emergency requiring action. All premises audible and visual notification appliances shall operate and the protected premises evacuated. A local audible alert shall sound, the alarm LED illuminate, and descriptive message appear on the LCD display at the panel and any remote annunciators until the panel is reset. The digital communicator transmits a fire alarm signal with specific point identification.

3. Supervisory Alarm: A supervisory signal indicates the need for action concerning a monitored fire suppression system, or the maintenance of related systems. The tamper switch on a sprinkler riser is a supervisory condition because the system cannot function with a closed valve. When permitted by the AHJ a signal from a duct-mounted smoke detector may also produce a supervisory signal. An audible alert shall sound, the supervisory LED illuminate, and descriptive message appear on the LCD display at the panel and any remote annunciators until silenced. The digital communicator transmits a supervisory signal with specific point identification.

4. Trouble: A trouble signal indicates a fault in a monitored circuit or component of the fire alarm system. This could be a short, open, or ground in a supervised circuit. It could also indicate a device or battery failure. A local audible alert shall sound, the trouble LED illuminate, and descriptive message appear on the LCD display at the panel and any remote annunciators until silenced. The digital communicator transmits a trouble signal with specific point identification.

5. Maintenance Alert: A maintenance alert is an early warning of a condition before a device becomes inoperable. This is usually a smoke detector that needs cleaning or other normal maintenance item. The maintenance alert shall display on the panel and any remote annunciator LCD display until acknowledged. No audible alert shall sound and no signal transmitted, in order that this condition not be confused with a supervisory or trouble condition.

6. Normal: All systems and supervised circuits functioning normally.

1.06 CIRCUIT TYPES

A. General: All low voltage fire alarm circuits shall be power limited, electrically or electronically supervised, and of the correct cable type and gauge. Low voltage fire alarm cables of various types are to be permitted within the same raceway or condition. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box, or raceway containing these conductors, as per NEC Article 760. T-taps in any electrically supervised circuit are prohibited by this specification. All junction boxes and conduit ends shall be marked red for all low voltage fire alarm circuits.

B. Signaling Line Circuit (SLC): A signaling line circuit is the backbone loop that interconnects all addressable intelligent devices and over which status, input, and output signals are carried. The operation of these circuits is critical to the operation of the system and they shall be wired in a Class A redundant loop with isolation modules. Class “A” Style 6 separation of cable routing shall be observed by NFPA 72.

C. Network Node Circuit: The main fire alarm panel and any network node sub-panels or remote annunciators shall use a supervised RS-485 or equivalent interface in network loop over which system status control input and output signals are carried. These circuits shall be wired in a Class A redundant loop, that will be automatically operated from either end. Separation of outgoing and return cable routing shall be observed by NFPA 72.

D. Notification Appliance Circuit (NAC): A notification appliance circuit provides operational power to and is directly connected to the audible and visual signals. These appliances have a relatively large current draw and circuits shall be of an adequate wire gauge to prevent a voltage drop below the rated operating voltage of the appliances. These circuits shall be wired Class “B” Style Y with electrical supervision and end-of-line devices.

E. Initiating Device Circuits (IDC): Initiating device circuits shall be used for conventional devices in the portable buildings and where it is necessary to interface to a contact type or conventional device such as a sprinkler riser waterflow switch, tamper switch, or projected beam detector. Initiating device circuits shall be arranged to serve like categories (beam detectors, heat detectors, tamper switches). Mixed category circuitry shall not be permitted in a single IDC. A two-wire IDC shall contain only devices that require point-contact to operate. A four-wire IDC shall include an additional supervised circuit to supply 24 VDC operating power to devices that require it. These circuits shall be kept short as possible and shall be wired Class “A” Style D with electrical supervision.

F. Low voltage, 24 VDC, fire safety control circuits shall be considered as, and meet all requirements of a supervised IDC.

G. Line voltage, 120 VAC, fire safety control circuits shall in all cases be of “fail safe” operation and shall not have back-up power. On activation of the fire alarm, or loss of power, all connected devices shall actuate to their fire safety condition (i.e., HVAC blower control relays shall open, smoke fire dampers shall close, and fire door holders shall release). These circuits shall be controlled by a power relay located within three feet of the breaker panel. Control relays shall be located within three feet of the unit controlled. The power relay shall feature properly rated electrical contacts for a 120 VAC, 20-ampere circuit. These circuits shall be switched by a relay controlled by the fire alarm system and wired by the Electrical Contractor. Line voltage control circuits shall be standard non-supervised line voltage circuits in conduit, with the same type of conductors as specified in Division 26 for light and power circuits.

1.07 SUBMITTALS

A. The submittal package shall include all items listed under Paragraph 1.03 Quality Assurances and the following:

1. Complete system drawings using Autocad Versions 2013 or later format, or compatible software to a scale of no less than 1/8” = 1’-0”. Indicate all system components by location, type and address number. The location of all fire alarm control panels, sub-panels, annunciator panels, initiating devices, notification devices and controlling devices shall be shown including all smoke detectors and remote resets for all smoke dampers and A/C units rated 2000 cfm and greater. All notification devices shall be numbered and the power tap used on each notification device identified where applicable.

2. Drawings shall clearly indicate circuit point-to-point wiring to all initiating, notification and controlling devices. Complete elementary wiring schematics shall be provided in color with identification numbers for all addressable devices. Drawings shall contain only fire alarm related devices.

3. Drawings shall indicate wire counts, type and size of wire or cable used and the size and type of all conduit and their locations throughout. Submittals shall clearly identify all system configurations.

4. Complete battery back-up calculations shall be provided in conformance with NFPA 72 for control panel and sub-systems.

5. Manufacturer’s descriptive equipment data sheets on every system component, which clearly identifies the component by, part number, type, etc. This includes data sheets for every module that is to be incorporated within the control panel.

6. Detailed information shall be provided concerning the programming methods and capabilities.

7. A complete bill of materials listing all system components, manufacturer, quantity and part number.

8. Complete detail of manufacturer's warranties on both equipment and installation. The manufacturer is required to warrant the entire system for a minimum of two (2) years. The two (2) year period starts on the day of Owner's acceptance of the building. Contractor shall provide a full test and system certification at the end of the first year at no cost to the Owner.

9. All submittals shall be approved by the local fire marshal prior to submittal to the Engineer. Approval by local fire marshal is not considered acceptance by the Engineer or Owner.

B. Approval of submitted material shall not relieve the contractor's responsibility for full compliance with the design drawings, specifications and applicable codes.

C. Work shall not be executed by the Contractor until submittals are approved.

D. Submittal drawings shall not deviate from design drawings, except to comply with fire codes or Fire Marshal requirements.

E. Submittal to include "Statement of Bid". Refer to paragraph 3.20.

F. Refer to SECTION 26 0100 – ELECTRICAL SPECIAL PROVISIONS for availability of drawings in electronic format.

1.08 ORGANIZATION – SUBMITTALS

A. Organize all required data in a 3-ring black binder of sufficient size (3-inch) with indexes.

B. Complete submittals for each project are to be processed at the same date, partial submittals will not and are not acceptable. All required submittals and data, bound together, submitted at one time.

C. Where literature is submitted covering a group or series of similar items, the applicable items must be clearly indicated on each copy with a highlighter pen, arrow, circle, or other means of identification clearly legible.

D. The Engineer's review of submittals is only for confirmation of adherence to design of project and does not relieve the Contractor of final responsibility for furnishing all materials required for a complete working system and in complying with the Contract Documents in all respects.

1.09 RECORD DRAWINGS

A. Upon project completion, an accurate CAD-generated fire alarm record drawing in color shall be posted adjacent to the main fire alarm panel located in the office, developed as follows:

1. Framed and secured to the wall and plan covered with clear acrylic panel.
2. Size to clearly show all required information.
3. Orient building to place the entry nearest to control panel at the bottom of plan.
4. "YOU ARE HERE" indicator with arrow.
5. Logical alarm zones.
6. Room names and numbers. Verify with Owner.

7. Show each initiating device with symbol and identification number as programmed in panel.
8. Do not show indicating (audio/visual) devices.
9. Symbol legend.
10. True north arrow.
11. Scale indicator.
12. Exit path

1.10 APPROVED INSTALLERS

A. The following companies have been approved by the Engineer to install fire alarm systems under this specification:

1. Rudd Alarms, Tyler, Texas – (903) 630-7833.
2. Texas Fire and Sound, Dallas, Texas – (214) 390-9282
3. Cintas, Arlington, Texas – Bill Cooper - (817) 640-2223
4. BCI Corporation, Grand Prairie, Texas – (214) 988-3040
5. iProtection Systems, Carrollton, Texas – David Ringenberger – (972) 236-5901
6. SAS Security Alarm Service, Plano, Texas – (972) 312-1700
7. FLSA, Inc., Euless, Texas – Mike Hubbard – (972) 224-9380
8. Total Fire & Safety – Greg Miller – (214) 578-5388.
9. Factory approved distributor of “Silent Knight” (Farenhyt Series) – requires Engineer’s approval prior to bidding.

B. Contractor shall use one of the above-approved installers.

C. Electrical Contractor shall list Fire Alarm Subcontractor on his bid. No deviation from listed company will be allowed. Statement of bid must be submitted with bid. Refer to Paragraph – STATEMENT OF BID.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Specification reference is for equipment manufactured by “Silent Knight” "Farenhyt" Series IFP-300. This equipment is a District Standard, and no alternates will be considered.

B. All fire alarm components including initiation, notification, and control equipment shall be approved, compatible for interconnection and shall be by a single manufacturer in all cases where possible.

2.02 CONTROL PANELS

A. The fire alarm control panel (FACP) shall be the Silent Knight IFP-300 analog addressable control panel (no equivalent). The audio amplifiers shall be the Silent Knight ECS-50W or ECS-125W voice evacuation units. The FACP must have a 6 amp power supply and be capable of expansion to a maximum of 54 total amps via bus connected expander modules that supervise low battery, loss off AC and loss of communication.

B. The system must contain at least one Silent Knight ECS-50 or ECS-125 watt amplifier and shall be expandable to 400 to 1000 watts utilizing up to 7 additional amplifiers. Each amplifier shall be capable of adding a 4 zone splitter (Silent Knight ECS-CE4) to distribute the audio information to different locations in the installation. The system shall have the capability of controlling up to 40 notification zones. The amplifiers must contain the capability of being remotely located through a four-wire communications circuit and a two-wire VBUS circuit. The system shall have the capability of adding up to 7 ECS-RCU remote command units.

C. The voice evacuation system must have the capability of downloading 15 to 60 second messages and utilize DSP technology for higher audio intelligibility.

D. The voice evacuation system shall be capable of operating at 25vrms or 70.7vrms and must be field selectable at the amplifier level. Systems that require additional modules for voltage conversion shall not be accepted.

E. The FACP must have Day/Night sensitivity capabilities on detectors and be capable of supporting up to 300 analog addressable points. This shall be accomplished via eight signaling line circuits (SLC) capable of supporting a minimum of 159 detectors and 159 module devices each. The main panel will contain one SLC circuit with the option of utilizing up to 6815 SLC expander modules. The communication protocol on the SLC loop must be digital.

F. The FACP must support a minimum of six programmable “Flexputs”. The panel must have a built in 160 character LCD annunciator with the capability of having an additional eight supervised remote annunciators connected in the field.

G. Panel shall operate from a dedicated normal 120 volt, 60 Hertz, single phase circuit. Power shall be transformed and rectified into 24 volt DC within the panel. System alarm-initiating device can be connected to signal line currents (SLC) Style Y in accordance with NFPA 72. Notification circuits (NAC) shall be Style Z in accordance with NFPA 72. Circuit breaker serving dedicated fire alarm circuits shall be rated at 20 amps, labeled in red, located in a visible area utilizing a self-laminating, flexible vinyl film, non-smear, machine printed label, at the power distribution panel as FIRE ALARM. A breaker panel key shall be stored within the locked cabinet of each fire alarm control unit. The location of all circuit breakers serving the fire alarm control unit shall be posted with machine printed label in the fire alarm control unit cabinets. Each cabinet shall be grounded securely to the building grounding system.

H. The microprocessor shall provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time of day, day of week, and day of year.

I. The fire alarm panel shall provide for a custom alphanumeric message location identifier to be associated with each addressable device hardware address. For any event or alarm, the alphanumeric display will show the devices hardware address and a custom message to clearly identify the location of the device involved.

J. Fire alarm, supervisory alarm, trouble, and maintenance alert conditions, with device hardware address and custom message location identifier, shall be displayed on an 160-character minimum liquid crystal display (LCD). The chronological event history of alarm and trouble conditions may also be displayed.

K. Keypad for functions and programming, two buttons for scrolling data on the LCD, four front panel switches for REST, ALARM SILENCE, TROUBLE SILENCE, and DRILL/ALL CALL and five LED's for Normal, Fire Alarm, Supervisory Alarm, Trouble, and Test/Program. When multiple devices are reporting alarm condition, there shall be a visual indication that other devices are in alarm.

L. The fire alarm system shall be capable of supporting up to eight (8) remote annunciators. LCD remote annunciator shall be Model RA-1000 with same control and display layout of FACP annunciator.

M. The system shall contain an EIA RS-232C serial communication port for transfer and printing of event history data, detector sensitivity reports, instructions, and operating sequences as required. The FACP shall be capable of sending packets of up to 80 ASCII characters followed by a carriage return (ODH) and a line feed (OAH) to the serial port. The output shall be formatted to make it possible for an external monitoring computer to recognize certain combinations of characters in certain locations within each 80 character string in order to interpolate the status of the FACP.

N. Incoming power shall be supervised. A green "POWER ON" LED shall continuously display while power is present.

O. Power supply/charger and batteries to supply power limited 24 VDC operating and emergency power to the system. The charger shall be capable of maintaining batteries in a fully charged state without damage and of bringing batteries from a fully discharged to a fully charged state within 72 hours of normal operation. Provide audible alarm and diagnostic LED's to indicate AC power failure, brown out, control unit CPU failure, low battery detection, battery disconnection, and system ground fault detection. Upon AC power failure, the power supply shall automatically transfer the system to battery back-up. The batteries are to be completely maintenance free. No liquids are permitted, fluid level checks for refilling, spills, and leakage shall not be required. If necessary to meet standby requirements, external battery and/or charger systems may be used. Provide sufficient battery capacity for operation without AC power for twenty-four (24) hours of normal supervision and five minutes alarm operation at the end of this period; include a 20% safety factory in battery calculations to insure adequate performance for the service life of the batteries.

P. Failure of either the primary (AC) or secondary (battery) power supply shall result in a trouble signal.

Q. The CPU and associated equipment are to be protected consistent with UL 864 standards so that voltage surges or line transients will not affect them. All external connections of the FACP shall withstand six kilovolt transients to chassis ground.

R. The system shall permit cabling for 24 volt control functions; IDC, NAC, and similar power limited auxiliary functions to be located in the same conduit with the multiplex communication loop (SLC). All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

S. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition. The FACP shall check for the presence of ground faults in field wiring and report results in the LCD readout, it is a violation of this specification for any ground fault detection system to be disabled.

T. A single ground or open on any system SLC, IDC, NAC, or fire safety control circuit shall not cause a system malfunction or the loss of ability to report an alarm.

U. Each peripheral device connected to the CPU shall be continuously scanned for proper operation. Data transmissions between the CPU and peripheral devices shall be reliable and error free. The transmission scheme used shall employ dual transmission or other equivalent error checking techniques.

V. The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time if any intelligent detector in the system responds with a reading that is below or above normal limits. The controller shall differentiate between long term drift above the pre-alarm threshold (maintenance alert, indicative of the need for cleaning) and a fast rise above the pre-alarm threshold (indicative of a smoldering fire).

W. Each addressable device on an SLC loop shall systematically report for type identification. Loss of signal from any addressable device shall at the control panel result in a trouble condition. If the inadvertent installation of another type sensor takes place, the system and installed device shall operate. However, a “WRONG DEVICE” trouble condition will display until the proper unit is installed or the programmed sensor type is changed.

X. The system shall be capable of on and off-site programming to facilitate changes in operation, sensor sensitivity, or system expansion. The unit shall contain non-volatile EPROM memory; loss of primary and secondary power shall not result in loss of programming information.

Y. All system software and firmware shall be UL listed with the control panel and protected from unauthorized changes. The microprocessor shall contain and execute on-site programmable logical statements for each control-by-event specific action to be taken when an alarm condition is detected at specific programmed points by the system. Control-by-event equations shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs. Any software or firmware changes made shall require a minimum of a 10% functional test of the system.

Z. The system shall store and recall a time and date of incident recorded chronological event history of alarm, supervisory, and trouble conditions. The event history shall store a minimum of four hundred events.

AA. Maintenance alerts shall be annunciated as an alert on the LCD only and shall not be confused as a trouble or an alarm. This feature shall in no way inhibit the receipt of alarm conditions in the system.

BB. The system shall on demand perform and print a detector sensitivity test, meeting requirements of NFPA 72, Chapter 7.

CC. Walk test, the fire alarm control panel shall permit testing by manually placing each initiating device in alarm. The control panel shall pulse the system audible devices on detection of each such alarm and automatically reset the panel, permitting a single serviceman to functionally test the entire system.

DD. Provide a digital alarm communicator transmitter control unit configured as a slave communicator for the transmission of the fire alarm control panel status signals over normal telephone lines.

EE. The built-in digital communicator power supply charger and batteries shall supply power limited 24 VDC operating and emergency power for the unit. The charger shall be capable of maintaining batteries in a fully charged state without damage and of bringing batteries from a fully discharged to a fully charged state within 48 hours of normal operation. Provide sufficient battery capacity for operation without AC power for 24 hours of normal supervision and five minutes alarm operation at the end of this period; include a 20% safety factor in battery calculations to insure adequate performance for the service life of batteries. Install battery cabinet in Owner-approved location.

FF. The communicator shall as a minimum have the capability to transmit three or four distinct signals to a digital alarm communicator receiver in industry standard formats as follows:

1. Waterflow Fire Alarm (when applicable)
2. General Fire Alarm
3. Supervisory Alarm
4. Trouble Condition

GG. The panel shall have provisions to allow for fire drills. The panel shall allow a switch-off of the fire alarm horns after acknowledgement of the alarm while the strobe lights maintain operation until panel is reset. The cut-off shall not apply to exterior horns.

HH. Provide a wireless radio communicator for stand-alone communication of the fire alarm system to the supervising station. The communicator shall be by “AES”, with specific product as approved by Owner to work with existing network. The communicator shall be mounted alongside or within the same area of the fire alarm control panel, a maximum of 15’ away. Install cabling connections as required by the manufacturer.

II. Notification Appliance Mapping Structure: All notification circuits and modules shall be programmable via a mapping structure that allows for a maximum of 250 output groups. Each of these groups shall have the ability to be triggered by any of the panels 125 Zones. A group may be triggered from zones individually, or may contain a global trigger for manual pull stations, fire drills and two different system alarms. Additionally each Zone will individually control the cadence pattern of each of the Groups that it is “Mapped” to so that sounders can indicate a variety of conditions. The Zone shall be capable of issuing a different cadence pattern for each of the Groups under its control. The mapping structure must also allow a group to be designated to “ignore cadence” for use with strobes and other continuous input devices. Zones shall have eight different output categories; Detector alarm, Trouble, Supervisory, Pre-alarm, Waterflow, Manual pull, Zone auxiliary one and Zone Auxiliary two. Each of the categories shall have the ability to control from 1 to 8 output groups with a cadence pattern. The patterns are; March code, ANSI 3.41, Single Stroke Bell Temporal, California code, Zone 1 coded, Zone 2 coded, Zone 3 coded, Zone 4 coded, Zone 5 coded, Zone 6 coded, Zone 7 coded, Zone 8 coded, Custom output pattern 1, Custom output pattern 2, Custom output pattern 3, Custom output pattern 4 and

Constant. This mapping/cadence pattern shall be supported by all system power supplies and Notification Expander Modules.

2.03 MODULES

A. Provide isolator modules in each SLC loop placed between every 25 or less devices. The isolator modulates shall isolate wire-to-wire short circuits on a SLC loop, which shall limit the number of other modules, or detectors that are incapacitated by the short circuit fault. If a wire-to-wire short occurs, the isolators on either side of the short shall automatically open-circuit. When the short is corrected, the isolators shall automatically reconnect the isolated section of the loop.

B. The isolator module shall not require any address setting, although each isolator may electrically reduce the capacity of the SLC loop by one detector or module address. The isolator module may be built into selected detector bases or mount in a standard 4-inch electrical box. Provide a LED, which shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short has been detected and isolated.

C. Isolator module shall be “Farenhyt” Model SD500-LIM.

D. Addressable monitor modules shall be provided where required to interface to contact alarm devices. The monitor module shall be used to connect a SLC to a supervised zone of conventional initiating devices, any normally open dry contact device. The monitor module will mount in a 4-inch square electrical box. Each IDC zone may be wired either Class A or Class B field-selectable. Each monitor module shall be set to a distinct address and internal identification code on the SLC, which the control panel shall use to identify the location, status, and type of device. A status/power LED shall be provided which shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel. The status LED shall illuminate steady upon detection of an alarm condition.

E. Each monitor module shall provide for automatic functional testing of the device from the main control panel and shall reset the IDC monitored when the panel in reset. Results of the test shall then be indicated on the LCD display.

F. Each monitor module shall have an engraved plastic nameplate permanently attached indicating the device function and control panel device identification number. Labels shall be 1/16” thick two-ply black/white acrylic sheet engraving stock with all sides beveled.

G. Addressable monitor module shall be “Farenhyt” Model IDP-Monitor with end-of-line devices as required.

H. Addressable control/relay modules shall be provided where required to provide relay controlled fire alarm functions. The control module will mount in a standard 4-inch electrical box. The control module shall provide a dry contact (Form C) relay with SPDT dry contacts rated at 2.0 amps at 24 VDC and 0.5 amps at 120 VAC (pilot duty).

I. Power to operate the relay actuation shall be provided by the SLC. Each control module shall be operated by events as programmed in the control panel (i.e., operate on alarm condition). Control modules shall feature status LED’s to indicate the module is operational and when the relay is energized.

J. Each control module shall be set to a distinct address and internal identification code on the SLC, which the control panel shall use to identify the location, status, and type of device.

K. Each control module shall be labeled in a visible area with its device hardware address utilizing self-laminating flexible vinyl film, non-smear, machine-printed labels visible from a distance of 10'-0".

L. Addressable control/relay modules shall be "Farenhyt" Model IDP-Relay.

2.04 RELAYS

A. Power relays shall be provided as required to control each fire safety control functions circuit, one or two circuits may be controlled by each relay. Each relay shall be operated by a 120 volt VAC coil and feature DPDT dry contacts rated 30 amps at 120 VAC. Each relay shall be mounted in a surface-mount metal enclosure with conduit knockouts. Relays shall be UL recognized and rated at ten million mechanical operations.

B. Power relay shall be "Air Products & Controls" Model MR-199X-14/C, 120 VAC coil, heavy duty power relay with metal enclosure, or approved equal.

C. Control relays shall be provided where a relay control interface is required to perform fire safety control functions; air handler shut-down, fire door control, etc. Each relay shall be operated by a multi-voltage coil (24 VDC, 24 VAC, or 120 VAC), feature SPDT dry contacts rated 10 amps at 120 VAC, and a status LED to indicate the relay is energized. Each relay shall be mounted in a surface-mount metal enclosure with a status LED viewing hole and conduit knockouts. Relays shall be UL recognized and rated at ten million mechanical operations.

D. Control relays shall be "Silent Knight" Model IDP-Relay, multi-voltage coil, control relay with metal enclosure.

2.05 SIGNAL POWER EXPANDER (SPX)

A. Provide as required additional power supplies for notification appliance circuits or as a remote power supply. All interior strobe flashing shall be synchronized and all interior audible signal tones shall be a synchronized code 3 pattern with external or built-in synchronization modules.

B. The signal power expander supply/charger and batteries shall supply power limited 24 VDC operating and emergency power. The charger shall be capable of maintaining batteries in a fully charged state without damage and of bringing batteries from a fully discharged to a fully charged state within 48 hours of normal operation. Provide sufficient battery capacity for operation without AC power for twenty-four (24) hours of normal supervision and five minutes alarm operation at the end of this period, include a 20% safety factor in battery calculations to insure adequate performance for the service life of batteries.

C. Each signal power expander shall have an engraved plastic nameplate permanently attached to the front indicating the panel identification number of the following format:

BOOSTER xxx OF xxx
Where “xxx” is the panel unit sequential number 1 to 999 at each location (coordinate with Owner). Labels shall be 1/16” thick two-ply black/white acrylic sheet engraving stock with all sides beveled.
Each signal power expander shall be connected to the FACP such that the trouble contacts on the power expander generate a trouble signal at the FACP.

D. Conduit shall enter the equipment backbox only where conduit entry is specified by the manufacturer.

E. Provide “Silent Knight” Model RPS-1000 or 5496 intelligent distributed power module(s) with built-in synchronization modules as required, no exceptions.

2.06 MANUAL PULL STATION

A. Manual pull station shall be addressable type, "Farenhyt" Model IDP-Pull-DA, with Stopper “II” protective covers with local alarm for all stations.

B. Manual fire alarm pull stations shall be provided at all exits and where indicated on the drawings. Each addressable manual pull station shall incorporate a transmitter and receiver having a unique identification and status reporting capability to the control panel.

C. Each manual station shall be attached to a SLC and be set to a distinct address and internal identification code, which the control panel shall use to identify the location, status, and type of device.

D. Each manual station shall be labeled in a visible area with its device hardware address utilizing self-laminating, flexible vinyl film, non-smear, machine printed labels visible from a distance of 10’-0”.

E. Stations shall provide a visible indication they have been operated. Stations shall require a key to be returned to normal condition, keyed alike to FACP. It is the responsibility of the Fire Alarm Contractor to insure that the pull stations provided allow key reset with the station protector frame/spacer in place.

F. Provide a tamper-proof clear Lexan shield with horn station protector over each pull station. When the shield is lifted, a continuous audible warning horn shall be activated. Lowering and realigning the shield shall silence the horn. The horn shall provide 85 dB at 10 feet and be powered by a standard 9-volt alkaline replaceable battery. Shall be a Stopper II Manual Station Protector with horn as manufactured by “Safety Technology International, Inc.”, Waterford, Michigan, Part Number STI 1100. Provide with spacer, Part Number STI 3100, for pull stations on surface mount backboxes as required.

G. “Farenhyt” Model IDP-Pull-DA, mounted on single-gang wall box.

2.07 INDICATION DEVICES – 2012 VOICE EVACUATION

A. Audible/visual signals shall conform to ADA Standards. Furnish and install where shown on the drawings or as required per NFPA and any local, state, federal codes, or laws. Strobe intensity (candela output) and audible decibel level shall be sized for the room size and area of coverage per ADA and NFPA/ANSI Standards. Audible signals shall be voice evacuation system speaker type. Housings shall be white in color (unless red is required by Authority Having Jurisdiction) and imprinted “FIRE”. Strobe lens shall be clear. All interior strobe flashing shall be synchronized.

B. Small rooms such as offices shall be provided with multi-candela strobe/speaker, “System Sensor” Model SPSWL wall device, or Model SPSCWL ceiling device, or approved equivalent by “Eaton Wheelock”.

C. Corridors up to 20’ wide shall be provided with multi-candela strobe speaker, “System Sensor” Model SPSWL wall device, or Model SPSCWL ceiling device, or approved equivalent by “Eaton Wheelock”.

D. Medium size rooms (typical classrooms), shall be provided with 75 cd strobe/speaker, “System Sensor” Model SPSWL wall device, or Model SPSCWL ceiling device (multi-candela set to 75 cd), or approved equivalent by “Eaton Wheelock”.

E. Large rooms (over 40’ longest wall), shall be provided with 110 cd speaker/strobe, “System Sensor” Model SPSWL wall device, or Model SPSCWL ceiling device (multi-candela set to 110 cd), or approved equivalent by “Eaton Wheelock”.

F. Exterior strobe/speakers shall provide 75 cd, “System Sensor” Model SPSRK with back box, or equivalent; weatherproof for outdoor installation per UL 1638 surface-mounted at 12’-0” above grade.

G. Exterior WATERFLOW ALARM strobe/speaker shall provide a 75 cd, “System Sensor” Model SPSRK with weatherproof backbox, or equivalent by “Eaton Wheelock”; weatherproof for outdoor installation per UL 1638 surface-mounted and a weatherproof sign approximately 12” wide x 6” high, white with red letters reading “WATERFLOW FIRE ALARM SIGNAL”. Configure fire alarm system to activate this signal on waterflow alarm only. Center signal and sign directly over Fire Department Connection (Siamese Port).

H. Strobe-only devices are accepted only in limited areas where speaker intelligibility is not a concern. “System Sensor” Model SRL wall device, or Model SCRL ceiling device, or approved equivalent by “Eaton Wheelock”.

I. Provide where indicated on the plans or required, protective polycarbonate or wire guards. Guards shall be a minimum of 1/8” thick clear polycarbonate or 10 gauge welded steel wire construction with a red epoxy powder coat finish; “Wheelock” Model EWR slotted horn/strobe enclosure; “Space Age Electronics, Inc.”, Marlboro, MA, Model SSU 03505 universal signal guard, or approved equivalent.

2.08 ADDRESSABLE HEAT (THERMAL) DETECTORS

A. Analog fixed thermal detectors shall be provided where indicated on the drawings. The intelligent thermal detectors shall connect via two wires to one of the intelligent control panel loops and be resettable from the FACP. The detector shall, on command from the control panel, send data to the panel representing the analog temperature level.

B. The fixed temperature element shall be rated at 135^{o} Fahrenheit for areas where ambient temperatures do not exceed 100^{o} Fahrenheit, and 200^{o} Fahrenheit for areas where the temperature does not exceed 150^{o} Fahrenheit.

C. The detectors shall provide a calibrated test method whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself, by activating a magnetic switch, or may be activated remotely on command from the control panel.

D. Each thermal detector attached to a SLC and shall be set to a distinct address and internal identification code, which the control panel shall use to identify the location, status, and type of device.

E. The detectors shall provide dual alarm and power/status LED's. Status LED's shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LED's may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected.

F. The detector shall be semi-flush ceiling-mounted and be provided with modular detector head with twist-lock base. Detectors shall be provided in smooth attractive white finish. Detectors shall be UL listed with respective control panel.

G. Each detector base shall be labeled in a visible area with its device hardware address utilizing self-laminating, flexible vinyl film, non-smear, machine-printed labels visible from a distance of 10'-0".

H. "Farenhyt" Model IDP-Heat with B210LP base.

2.09 ADDRESSABLE SMOKE DETECTORS

A. Analog photoelectric smoke detectors shall be provided where indicated on the drawings. The intelligent photoelectric detectors shall be resettable from the FACP. The detectors shall operate by the photoelectric light-scattering principal using an LED light source to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density. The detector shall provide automatic sensitivity drift compensation to provide longer term stability and reliability. The detector shall also provide a maintenance alert feature whereby the detector shall initiate a trouble condition should the unit's sensitivity approach the outside limits of the normal sensitivity window. In addition, the detector shall also be provided with extensive RF and EMF noise immunity. Detectors shall withstand wind gusts to 4,000 feet per minute without false alarming or initiating a trouble indication.

B. The detector shall provide a calibrated test method whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself, by activating a magnetic test switch, or may be activated remotely on command from the control panel.

C. Each smoke detector shall be attached to a SLC and set to a distinct address and internal identification code, which the control panel shall use to identify the location, status, and type of device.

D. The detectors shall provide dual alarm and power/status LED's. Status LED's shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LED's may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified.

E. The detector shall be semi-flush ceiling-mounted and be provided with modular detector head with twist-lock base. Detectors shall be provided in smooth attractive white finish, and be sealed against dirt, vermin, and backpressure. Detectors shall be provided with fine mesh insect/contaminate screen. Detectors shall be UL listed with respective control panel.

F. Each detector base shall be labeled in a visible area with its device hardware address utilizing self-laminating, flexible vinyl film, non-smear, machine printed labels visible from a distance of 10'-0".

G. Analog smoke detectors shall communicate analog values using a digital protocol to the control panel for the following functions:

1. Automatic compliance with NFPA 72 Standards for detector sensitivity testing.
2. Drift compensation to assure detector is operating correctly.
3. Maintenance alert when a detector nears the trouble condition.
4. Trouble alert when a detector is out of tolerance.
5. Alert control panel of analog values that indicate fire.

H. For each smoke detector mounted to the vertical shaft of a skylight provide a Red-Dot Model Number VM-01 wall-mount fixture bracket (remove socket).

I. Except for temporary testing, smoke detectors shall not be installed until the building is ready for occupancy and cleaned and dust free as possible.

J. Install smoke detectors above main fire alarm control panel, all extender panels and in all electrical rooms, MDF and IDF Rooms.

K. Install isolation bases to isolate each twenty-five (25) smoke detectors. Each base shall be clearly identified.

L. "Farenhyt" Model IDP-Photo with B210LP base.

2.10 ADDRESSABLE DUCT-MOUNTED SMOKE DETECTORS

A. Duct-mounted detector housings with ionization detector heads shall be provided where shown on the drawings, or as required. Detectors shall operate by ionizing both a sampling chamber and a reference chamber with a single radioactive source. If visible smoke or invisible gases enter the sampling chamber the change in current flow is amplified will trigger the detector to alarm when a critical level is reached. The detector shall operate in air velocities of 300 to 4,000 ft./min. without a shift in sensitivity. Each detector shall be resettable from the FACP.

B. The unit shall include a 16-gauge steel or Noryl-molded plastic enclosure with molded integral conduit knockouts. The unit shall be provided with gasket seals to provide proper sealing of housing to mechanical ductwork and to insure proper air flow into the detector sampling chamber. Duct housing shall be designed to easily mount to rectangular or round ducts.

C. Each duct-mounted detector housing shall be labeled in a visible area with its device hardware address utilizing self-laminating, flexible vinyl film, non-smear, machine printed labels visible from a distance of 10’-0”.

D. The duct detector unit shall be U.L. listed to the most current U.L. 268A standard and be cross-listed for use with the fire alarm control panel. Each duct unit shall be equipped with sampling tubes protruding into the associated ductwork. For ducts up to 3’ wide, the supply tube shall be 1” shorter than the duct width. For ducts 3’ to 8’ wide the sampling tube to be 1” longer than the duct width and protrude through the opposite side of the duct for support. Duct widths greater than 8’ will require internal bracing. Sampling tubes shall be configured to provide adequate air flow through the detector housing and fitted with an integral porosity filter system to aid in reducing detector contamination. Detectors shall be installed per NFPA 90A and the manufacturer’s instructions.

E. When smoke is detected by a duct-mounted smoke detector it shall activate either a supervisory fire alarm condition at the fire alarm control panel as directed by the AHJ. Duct-mounted smoke detectors shall indicate a supervisory alarm unless otherwise directed, duct-mounted smoke detectors are not a substitute for area detection. In either case the activation of any duct-mounted smoke detector shall actuate all related air handler shut down relays, smoke fire damper motors, fire door release devices, etc.

F. Each smoke detector shall be attached to a SLC and set to a distinct address and internal identification code, which the control panel shall use to identify the location, status, and type of device. Duct detectors must be powered from the fire alarm system.

G. Each detector shall be provided with a remote power/status LED with magnetic remote test station. The remote test station shall be located below ceiling in the nearest corridor at 80” A.F.F. unless otherwise directed. The status LED shall illuminate a green pilot LED under normal conditions, indicating that the detector is operational and in regular communication with the control panel. A red LED shall be plated into steady illumination when a supervisory condition has been detected.

H. Each remote LED faceplate shall be labeled in a visible area with its device hardware address utilizing self-laminating, flexible vinyl film, non-smear, machine printed labels visible from a distance of 10’-0”.

I. Each HVAC unit for which a duct-mounted smoke detector is installed shall also have a blower shutdown relay as listed below.

J. Duct-mounted smoke detector housings and sample tubes shall be furnished by the Fire Alarm Contractor and mounted by the Mechanical Contractor. Coordinate with the Mechanical Contractor.

K. Each A/C unit and heat pump unit shall be provided with duct type (or room type if indicated) smoke detector in the return air as required by code, which shall deactivate unit and energize fire alarm upon detection of products-of-combustion. Duct detector shall be furnished by the Fire Alarm Contractor and installed by the Mechanical Contractor in compliance with NFPA 90A. The number of units at each school is indicated on the Mechanical Drawings. Coordinate with the Mechanical Contractor as required. Smoke detectors shall be provided as follows:

1. Each individual A/C unit and heat pump unit greater than 2,000 cfm.

2. Each A/C unit and heat pump unit interconnected by ducted outside air distribution systems, regardless of individual unit size. EXCEPTION: Not required only if allowed by local Fire Marshal.

3. Smoke detectors are not required for individual units rated 2,000 cfm or less and served by individual outside air ventilation.

4. Fire Alarm Contractor shall provide for a minimum of fifteen (15) detectors. Fire Alarm Contractor shall be responsible for exact number of smoke detectors required.

L. Smoke duct detectors shall be addressable type with reset at the main control panel. Smoke detectors shall be zoned separately, and shall indicate the zone and unit designated on the drawings. EXAMPLE; “SMOKE DETECTORS ZONE 1, A/C #2”, etc.

M. “Silent Knight” Model SK-Duct housing with base, DSTS sampling tube, SK-PhotoR ionization detector head with control relays for HVAC shutdown and RTS151 remote test station.

2.11 HVAC UNIT BLOWER SHUT-DOWN AND SMOKE FIRE DAMPER OPERATION

A. Provide a power relay for each fire safety control circuit as required to operate smoke fire dampers, control relays for shut-down of each air handler, etc.

2.12 AUTOMATIC FIRE SUPPRESSION SYSTEMS

A. All automatic fire suppression systems shall be monitored by the fire alarm system. The activation of any automatic fire suppression system shall produce an alarm condition. The kitchen ventilation hood suppression system shall provide contacts to monitor activation of system, coordinate with Architectural Specifications. Provide addressable monitor modules in a separate red 4x4 junction box as required for alarm functions; Model No. IDP-Monitor.

B. The activation of automatic fire suppression system in kitchen shall also actuate shutdown of air handler(s) serving kitchen.

2.13 ELECTROMAGNETIC DOOR HOLD BACK AND RELEASE

A. Provide electromagnetic door hold back and release devices as shown on the drawings or as required.

B. When combination door holder/closers exist, replace with “Norton Door Closure” Model 8501BF and separate door holder Model ESL-DHF24120C for wall-mount or ESL-DHFM-11224 for floor-mounts.

C. The Fire Alarm Contractor shall verify voltages, exact style, and quantity required with plans.

D. Operating power shall be provided by the fire alarm control panel.

2.14 SPRINKLER RISER WATER FLOW AND TAMPER SWITCHES

A. Water flow and tamper switches shall be provided and installed by a Texas licensed fire sprinkler system contractor. Fire Alarm Contractor is responsible for subcontracting the Texas licensed fire sprinkler system contractor and should meet the following requirements:

1. Provide a cabinet of spare heads. Coordinate head count with Owner.

2. Integral, mechanical, non-coded, non-accumulative retard type device with a normally-open dry contact for supervision by the fire alarm system.

3. Flow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.

4. Flow switches shall be located a minimum of one (1) foot from a fitting that changes the direction of the flow and a minimum of three (3) feet from a valve.

B. Sprinkler and standpipe valve supervisory switches shall be provided and installed by the sprinkler system contractor and should meet the following requirements:

1. Each sprinkler system water supply control valve riser or zone control valve and each standpipe system riser control valve shall be equipped with a supervisory switch device with a normally-open dry contact for supervision by the fire alarm system. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches. Switches shall have “Farenhyt” IDP-Monitor addressable monitoring modules.

2. Each post indicator valve (PIV) or main gate valve (if any) shall be equipped with a supervisory switch.

3. Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

4. The mechanism shall be contained in a weatherproof aluminum housing that shall provide a ¾-inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.

5. Switch housing shall be finished in red baked enamel.

6. The entire installed assembly shall be tamper-proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.

7. When applicable, air or water pressure, tank level, temperature switches, or pump supervision devices shall each be provided with a normally-open dry contact for supervision by the fire alarm system.

2.15 CABLING

A. The Fire Alarm Contractor shall provide and install new and unused ASTM bare solid or stranded copper conductor cable per ANSI/NEMA and NFPA codes. Follow the manufacturer's instructions. All cable shall be U.L. listed for fire protective, power limited applications. All cable exposed in plenum attic spaces shall comply with UL 910, UL 1424, and UL 1581 vertical tray flame test.

B. Cabling shall be in accordance with local, state, and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16 AWG for signaling line circuits, and 14 AWG (1.63 mm) for notification appliance circuits.

C. Cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLP).

D. Signaling Line Circuit (SLC): Use red 16 AWG or larger shielded or unshielded cabling as recommended by the FACP manufacturer. When recommended, shielded cable should be utilized to minimize electrical noise interference with data transmission. All wiring for intelligent/addressable data circuits shall be red shielded twisted pair, low capacitance, NEC Type FPLP, "West Penn Wire" No. D60991 – 16 AWG, or No. D60992 – 14 AWG, overall shield 100% aluminum polyester foil, data cable, one twisted pair. Shield drain wire shall be grounded at one end only. Equivalent manufacturers are "Atlas", "Belden", "BSCC", or "Remee".

E. Notification Appliance Circuit (NAC): All audible/visual signaling circuits shall be yellow NEC Type FPLP, "West Penn Wire" No. 50972 – 14 AWG, or No. 50974 – 12 AWG, two-conductor signaling cable. Equivalent manufacturers are "Atlas", "Belden", "BSCC", or "Remee".

F. Install two (2) telephone lines in conduit to telephone board. Install two (2) telephone surge protectors. Install data cabling to nearest IDF/MDF room as required.

G. Cable color shall be "yellow" for NAC circuits and "red" for SLC circuits.

2.16 MAIN CONTROL PANEL AND REMOTE RESET STATION LOCATION

A. Main control panel shall be installed in the main office area at a location approved by the Owner and Fire Marshal.

B. Locations of remote reset stations for dampers and air handling unit smoke detectors shall be approved by the Architect and local authority having jurisdiction prior to installation. Generally, these will be on ceilings below dampers and units close to and in a corridor wall. Indicate all these devices on shop drawing submittals.

2.17 TRAINING

A. The Fire Alarm Contractor shall provide on-site factory approved training and certification for three (3) Owner employees. Training shall comply with state and federal regulations.

B. The Fire Alarm Contractor shall provide Owner with licensing for the fire alarm control panel system software with the capability for use with a Windows-based laptop computer, including technical manuals, code keys and software. Software shall be provided on a CD-ROM, passwords and proprietary setup procedure shall be documented.

C. The Fire Alarm Contractor shall conduct formal on-site training sessions at the school location. It shall be the responsibility of the Contractor to coordinate time and location of training sessions with the Owner. Provide documented general instruction as follows:

1. Provide instruction to the maintenance personnel to include the location, inspection, maintenance, testing, and operation of all system components. Provide a minimum of two (2) hours – two (2) 1-hour sessions separated by a minimum of two weeks.

2. Provide instruction to designated personnel on the functions and operation of the fire alarm and detection system including capabilities, limitations, monitoring, and the meaning of status messages. State the proper procedure for fire drills, routine maintenance, and request for service. Provide a minimum of two (2) hours – two (2) 1-hour sessions separated by a minimum of two weeks.

3. Conduct a supervised fire alarm drill with full building evacuation.

2.18 RECORD DRAWINGS AND UPGRADES

A. Upon completion of the installation and prior to final observation, the Fire Alarm Contractor shall furnish five (5) copies of record drawings. Provide one (1) reproducible and four (4) prints. Also, provide the record drawings as Autocad files on a CD-ROM. In addition, the Fire Alarm Contractor shall furnish four (4) copies of a complete operating and maintenance manual listing the manufacturer's name(s), including technical data sheets. Manuals shall include wiring diagrams to indicate internal wiring for each device and the interconnections between the items of equipment. Provide the Owner a CD-ROM with a copy of the panel control software including the licensed program, site specific data files, and passwords that the Owner may require to maintain the system. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system. Provide a parts list with manufacturer and model number for commonly replaced parts. Include complete instructions for the inspection, testing, and maintenance of the system.

PART 3 - EXECUTION

3.01 SYSTEM OPERATION

A. When a fire alarm condition is indicated by any manual pull station, heat detector, area smoke detector, sprinkler system waterflow indicating device, any automatic fire suppression system monitor, or by any duct-mounted smoke detector (when applicable) shall cause the following actions or effects to take place:

1. The 80-character LCD display shall indicate all pertinent information associated with the alarm condition and its location.

2. The digital communicator shall activate and transmit a WATERFLOW ALARM or ALARM signal to the monitoring company with addressable point identification.

3. All audible and visual signal devices shall operate until silenced manually, or until automatically silenced, by the control panel. Strobes shall continue to flash until the alarm has been reset. A subsequent alarm from another device shall automatically reactivate all audible and visual signal devices. Once a waterflow alarm, when applicable, has been activated in shall not be possible to manually silence the audible and visual signal devices until the flow indication from the waterflow switch has ceased.

4. All automatic programs assigned to the alarm point shall be executed and associated indicating devices and relays shall be activated.

5. Instantaneous activation on general alarm of air conditioning unit related fire safety control function shut-down relays and smoke fire damper motors.

6. Instantaneous release on general alarm of any controlled non-fire rated security doors or gates that are designed to release (in order to provide free egress from the building).

7. Conditioning activation on general alarm of any release devices for overhead or hinged fire or smoke rated doors or shutters (that are designed close in order to control the spread of fire or smoke). These devices shall be programmed to release only when the smoke detectors adjacent to that particular door detect smoke.

8. The FACP event history storage equipment shall log the information associated with each new fire alarm control panel condition, along with time and date of occurrence.

B. The detection of any system internal or external trouble condition or the actuation of any supervisory alarm condition; sprinkler system valve tamper switch, sprinkler system low pressure switch, etc., or a duct-mounted smoke detector (when applicable) will automatically cause the following actions to take place:

1. At the panel and any remote annunciators, a system supervisory alarm LED or trouble LED shall flash as appropriate and a local sounding device shall activate. Audible supervisory or trouble alerts that have been silenced shall automatically resound every twenty-four hours or less until repairs are made.

2. The 80-character LCD display shall indicate all pertinent information associated with the trouble or supervisory condition and its location; however, unacknowledged alarm messages shall have priority over trouble messages.

3. The digital communicator shall activate and transmit a SUPERVISORY or TROUBLE signal to the monitoring company with addressable point identification.

3.02 WIRING METHODS

A. Circuits shall be "Class A", except notification appliance circuits (NAC) may be Class “B”. Run circuits in conduit in all exposed areas. Plenum type Teflon 150ºC rated cable may be used above lift-out ceilings.

B. Wire sizes shall be in accordance with NEC 760, and minimum shall be #16 AWG. Cable must be separated from any open conductors of power or Class 1 circuits, and shall not be placed in any conduit, junction box, or raceway containing those conductors per NEC Article 760. Wiring must be installed in accordance with BICSI wiring standards. All wire in cabinet shall be properly placed in neat arrangement without any excess wire lengths.

C. All zone and circuit wiring shall be color-coded. All junction boxes and conduit ends shall be marked “red” for all low voltage fire alarm circuits.

D. Cable shall be stamped approved for fire alarm use. All wiring in FACP, boosters and intelligent power supplies shall be labeled with a machine printed label. All labeling shall comply with Owner standards and requirements of this specification.

E. Wire system for strobe operation along with audible units, except all exterior horn strobe units shall have the ability to leave strobes "ON" and turn horns "OFF" until the entire building system is reset.

F. Install protective covers on all strobe and horn units in Activity Rooms or Gymnasiums.

G. All fire alarm installation incurring wiring shall be performed by Fire Alarm Contractor personnel only.

3.03 CABLE ROUTING INSTALLATION

A. System wiring and equipment installation shall be in accordance with good engineering practices as established by the NFPA, NEC 760, the Texas Insurance Code, and Owner wiring and support standards which may be more stringent than acceptable industry standards. Contractor shall review these Owner Standards prior to bidding. Wiring all meet all state and local electrical codes.

B. All wiring shall test free from opens, grounds, or shorts. All fire alarm cable shall be supported from the building structure and bundled. Do not attach any supports to joist bridging or other lightweight members. The support system shall provide a protective pathway to eliminate stress that could damage the cabling. The cable shall not be crushed, deformed, skinned, crimped, twisted, or formed into tight radius bends that could compromise the integrity of the cabling.

C. In all exposed areas such as activity room, janitors' closets, or mechanical/electrical rooms, all fire alarm cable shall be fully enclosed in conduit.

D. Fire alarm cables shall be run in conduit stubs from single-gang wall boxes to accessible areas above finished ceilings. Conduit shall be required only within walls and concealed spaces to provide access. Provide a plastic snap in bushing at each end of all open conduit stubs or sleeves, "Thomas & Betts" No. 443 – ¾", No. 424 – 1", No. 425 – 1-1/4", No. 427 – 2"; "Arlington Industries" EMTxxx Series insulating bushings, or approved equal.

E. Fire alarm cables shall be run in bundles above accessible ceilings and supported from the building structure. Cabling shall be loosely bundled with cable ties randomly spaces at 30-48" on center. Cable ties shall not be tight enough to deform cabling and shall not be used to support the cabling. Cabling shall be run in highest point of red iron where possible.

F. Fire alarm cable must not be fastened to electrical conduits, mechanical ductwork or piping, sprinkler pipes, or routed to obstruct access to hatches, doors, utility access panels, or service work areas. Do not route cables through fire doors, ventilation shafts, grates, or parallel for more than four-feet with line voltage electrical conductors. Fire alarm cables shall not be run loose on ceiling grid or ceiling tiles.

G. Support shall be provided by mounting appropriate fasteners that may be loaded with multiple cables. Provided that the weight load is carried by the support rod or wire, the support assembly may attach to the ceiling grid for lateral stabilization. The required support wires for the ceiling grid or light fixtures shall not be utilized. Any fastener attached to the ceiling grid shall not interfere with inserting or removing ceiling tiles. The cable pathway of supports must be positioned at least 12 inches above the ceiling grid.

H. All cabling shall be placed with regard to the environment, EMI/RFI interference, and its effect on fire alarm signal transmission.

I. Do not route any fire alarm cable within two feet of any light fixture, HVAC unit, service access area, electric panel, or any device containing a motor transformer.

J. Fire alarm cable will not be installed in the same conduit, raceway, tray, duct, or track with the line voltage electrical cable without a metallic barrier meeting NEC requirements.

K. Maximum cable pulling tension should not exceed 25 lb./ft. or manufacturer's recommendation, whichever is less.

L. Any pulling compounds utilized must be approved by the cable manufacturer and shall not degrade the strength or electrical characteristics of the cable.

M. No terminations or splices shall be installed in or above ceilings.

N. No t-taps shall be permitted.

O. Cable bends shall not be tighter than the manufacturer's suggested bend radius.

P. Mount all equipment firmly in place such that vibration or jarring will not activate an alarm, supervisory, or trouble signal. Route cable in a professional, neat and orderly installation.

Q. All cable shall have a label on both ends utilizing self-laminating, flexible vinyl film, non-smear, machine printed labels.

R. Each cable run shall include a three-foot service loop with wire tie located in the ceiling above the control unit panel. This is to allow for future re-termination or repair.

S. Provide for adequate ventilation to all equipment racks and take precautions to prevent electromagnetic or electrostatic hum.

T. All conduit, ducts, track, and raceways shall be supported from the structure at industry standard intervals for the size specified, utilizing proper anchoring devices. Cable fill may not exceed the manufacturer's instructions for each type of support.

U. Devices mounted on a drop ceiling shall feature a back box fitted with a support hanger, "Caddy" No. 512 or approved equal.

3.04 TERMINATIONS

A. Strip back only as much cable jacket as required to terminate.

B. Do not "loop" over wiring terminals – the cable could come loose and the condition not be detected as an open circuit or disconnected device.

C. Preserve wire twists as closely as possible to point of termination (0.5" maximum) to keep signal impairment to a minimum.

D. Avoid twisting cable during installation.

3.05 J-HOOKS & CABLE TIES

A. Attachments for cabling support shall be spaced at approximately 48-60 inches on center. The cable bundle shall not be allowed to sag more than 12 inches mid-span between attachments. Attachments shall be sized as follows:

1. Single cables or bundles up to four cables may be supported directly by the building structure.

2. Bundles for five to ten cables: 2" bridle ring, "Caddy" #4BRT32 or equal.

3. Bundles for eleven to sixteen cables: ¾" J-Hook, "Caddy" #CAT12 or equal.

B. Do not mix different signal strength cables on the same J-hook (i.e., fire alarm with telephone/data cable). Multiple J-hooks can be placed on the same attachment point, up to the rated weight load of the attachment device.

C. "Velcro" hook and loop cable straps shall be furnished and installed to attach wire bundles to supports and for appropriate wire management as required.

3.06 FACP, DIGITAL COMMUNICATOR & SIGNAL POWER EXPANDERS SURGE & AMPERAGE PROTECTION (ELECTRICAL CONTRACTOR)

A. In addition to all the built-in panel surge protection on each incoming 120 VAC power circuit, electrical surge protection shall be provided for each fire alarm control panel, digital communicator, signal power expander and all other 120 VAC power fire alarm control units. Each power circuit surge protector shall be mounted in a standard grounded metallic electric box that is located as close as practical to the protected equipment. The grounding terminal shall be connected to building approved ground with 12 or 10 gauge solid wire and hard-wired in the incoming power circuit. Unit shall be an advanced multi-stage hybrid, solid-state power line protector. The unit shall provide the following features:

1. UL 1283EMI/RFI filtering
2. Common mode and normal mode suppression
3. UL 1449 3rd Edition approved, Type 2
4. Dry contacts for remote notification
5. 600V protection rating
6. Peak surge current 54kA
7. Operational temperature 0°C to +40°C
8. Protection status indication LED
9. Operational voltage 120 VAC, 60 Hz
10. Operational current 20 amps service
11. Compression screw terminations
12. Dimensions (H x W x L) 2.5 in. x 3.5 in. x 6.87 in.

B. Provide “Ditek” DTK-120SRD Series connected surge protector.

C. These devices and all required dedicated 120 volt circuits for fire alarm systems devices shall be installed by the Electrical Contractor.

D. Install unit in separate red cabinet.

3.07 FIRE ALARM CIRCUIT SURGE AND AMPERAGE PROTECTION (FIRE ALARM CONTRACTOR)

A. Electrical surge protection shall be provided within building as required in other paragraphs of this fire alarm specification, and at all entrance connections and on each copper pair that connects one building to another (i.e., any other portion of a building complex not under one continuous roof) at both exit points to prevent damage to equipment. Each device shall mount in a standard grounded metallic electric box that is located as close as practical to the protected equipment. The grounding terminal shall be connected to building approved ground with 12 or 10 gauge solid wire. Provide “Emerson” Network Power Hardwire Transient Voltage Surge Protection Devices as required, as follows:

1. EDCO Model SCLP-30 with PCB1B base – Exterior Signaling Circuits (SLC
2. EDCO Model PC642C-008LC with PCB1B base – Exterior Network Node Circuit
3. EDCO Model PHC-043 with PCB1B base – Exterior Notification Appliance Circuit (NAC)
4. EDCO Model FAS-1-033HC (single pair) – Exterior 2-wire Initiating Device Circuits (IDC)
5. EDCO Model FAS-2-033HC (two pair) – Exterior 4-wire Initiating Device Circuits (IDC)
6. EDCO Model FAS-31XT – Digital Communicator Telephone Line Circuits

B. “EDCO” circuit surge suppressors shall be installed in separate red cabinet and grounded in accordance with manufacturer’s recommendations. Ground shall connect to building steel at code-approved point.

C. Fire Alarm Contractor to furnish and install low voltage surge protection.

3.08 CONDUIT SIZE

A. Minimum conduit size shall be 3/4". Conduit system is not indicated on the drawings. All fire alarm junction boxes shall be painted red with “F.A.” stenciled on the outside.

3.09 MANUFACTURER'S INSTRUCTIONS

A. Contractor shall furnish and install in accordance with manufacturer's instructions all wiring, conduit, and outlet boxes required for the installation of a complete system as described herein and as shown on the plans.

3.10 EXTRA MATERIAL AND ALLOWANCES

A. Provide six (6) keys of each type.

B. Provide three (3) of each type of automatic smoke detector.

C. Provide three (3) of each type of any special tools, wrenches, etc., required for system use and maintenance. Riser system requires special tools.

D. Allow for three (3) additional horn/ speaker/strobe units.

E. Allow for two (2) additional manual stations and covers.

F. Allow for two (2) additional smoke detectors.

G. Allow for two (2) additional duct-mounted smoke detectors.

H. Allow for two (2) additional control relays.

I. All allowance items shall be installed at locations designated by the Architect complete with all wiring, etc., required for proper operation. Items not used shall be credited back to the Owner.

3.11 PROTECTIVE COVERS

A. All devices located in Activity Rooms or Gymnasiums shall have approved protective covers.

3.12 ADDRESSABLE DEVICE IDENTIFICATION TAGS

A. All addressable devices shall have a machine-printed address tag permanently attached. Address must be clear and readable from eight-foot (8’) distance.

B. Remote LED indicators where installed on lift-out ceilings shall be installed adjacent to ceiling support bar and identification tag shall be mounted to the bar with the wording “DUCT DETECTOR”, along with its addressable number.

3.13 DEDICATED 120 VOLT POWER CIRCUITS

A. Power circuits are not indicated on the drawings. Electrical Contractor shall provide a dedicated power circuit and TVSS (as specified) for main fire alarm control panel and all signal extenders, etc., that require 120 volt power. Electrical Contractor shall allow for six (6) 120 volt single phase dedicated circuits based on one (1) 1 pole, 20 amp circuit breaker and two (2) #12 and ground in ½” conduit for each.

B. Install an engraved nameplate on each piece of equipment served by a dedicated circuit indicating the panel and circuit number.

C. Install an engraved red nameplate by each breaker in each panel serving these dedicated circuits with the following wording in ¼” high white letters:

LOCATION_____
120 VOLT POWER

PANEL_____

CIRCUIT #_____

LOCATION_____

3.14 TESTING AND CERTIFICATION

A. The manufacturer shall be responsible for the testing and certification of the complete system. Manufacturer shall thoroughly test all system items for correct operation prior to the trial operation.

B. The system testing sequence shall include a trial operation of all main equipment. The manufacturer shall include for all necessary programming and adjustment to insure that the system is properly tested. The trial operation shall consist of:

1. Operating all pull stations
2. Testing all smoke detectors in each corridor
3. Testing all smoke detectors in individual rooms
4. Testing all damper duct detectors
5. Testing all air handling unit detectors

C. The manufacturer shall issue a certified report stating that the system has been satisfactorily tested. The report shall be submitted for approval and include all test sheets included herein.

D. The Fire Alarm Contractor and equipment manufacturer's start-up technician shall furnish test equipment.

E. Notify the Architect, Engineer and City Fire Marshal fourteen (14) days prior to testing. The Fire Marshal and Engineer shall have the option of being present for all testing.

3.15 INSTALLATION VERIFICATION - PRESTART

		FIRE ALARM MANUFACTURER	ELECTRICAL CONTRACTOR
A.	Confirm system is complete and clean, and wired as Class "A" for SLC wiring.	_____	_____
B.	Confirm written documentation details system checkout and calibration is complete. Documentation to include smoke detector location and sensitivity.	_____	_____
C.	Verify system is installed per plans and specifications.	_____	_____
D.	Verify equipment is installed per approved shop drawings and submittals.	_____	_____
1.	Indication devices	_____	_____
2.	Smoke detectors	_____	_____
3.	Pull stations	_____	_____
4.	Flow switches	_____	_____
5.	Tamper switches	_____	_____
6.	Heat detectors	_____	_____
7.	Magnetic door holders	_____	_____
E.	Verify additional devices have been delivered to the Owner.	_____	_____
F.	Installation verification complete.	_____	_____

3.16 FUNCTIONAL PERFORMANCE TEST

A. Device Verification (List all devices and locations, initialing approval here only when all devices pass the test. Include list of devices with this sheet for record purposes.)

		FIRE ALARM MANUFACTURER	ELECTRICAL CONTRACTOR
1.	Verify operation of tamper switches on each shutoff valve. List each valve location as operation is verified.		
2.	Verify each shutoff valve incorporates a locking device to prevent inadvertent closing of valves.		
3.	Verify operation of each flow switch by opening test valve to generate flow. Record location of each test valve and its associated flow switch.		
4.	Verify operation of fire alarm initiating devices. List device, location, zone, and sensitivity of each device. Submit list to Engineer for record.		
5.	Verify operation of signaling devices. List location of each signaling device.		
6.	Verify all alarms generated during test are annunciated at the main fire alarm control panel and annunciator (if any), listing proper device and/or zone.		
B.	Operation:		
1.	Manually pull all pull stations to initiate an alarm. Verify the following occurs:		
a.	An audible evacuation alarm shall sound a continuous alarm through the indication devices and voice evacuation systems (if any) shall operate.		
b.	The visual evacuation alarm devices (strobes) shall flash rapidly.		
c.	The master fire alarm control panel shall notify the fire department.		

		FIRE ALARM MANUFACTURER	ELECTRICAL CONTRACTOR
d.	Appropriate zone shall be annunciated at main control panel and annunciator (if any).	_____	_____
e.	All general building fans shall be shut down.	_____	_____
f.	The elevator (if any) shall recall to First Floor.	_____	_____
g.	Automatic magnetic doors close.	_____	_____
h.	Stairwell and elevator pressurization fans (if any) shall start.	_____	_____
2.	Verify operation of key-operated silencing switch located adjacent to fire alarm panel.	_____	_____
3.	Reset pull station and fire alarm control panel. Verify systems return to normal.	_____	_____
4.	Initiate an alarm from a sprinkler water flow switch. Verify the following occurs.		
a.	An audible evacuation alarm shall sound a continuous alarm through the indication devices and voice evacuation (if any). Systems shall operate upon alarm initiation.	_____	_____
b.	The visual evacuation alarm devices (strobes) shall flash rapidly.	_____	_____
c.	The master fire alarm control panel shall notify the fire department.	_____	_____
d.	Appropriate zone shall be annunciated at main fire alarm panel.	_____	_____

		FIRE ALARM MANUFACTURER	ELECTRICAL CONTRACTOR
e.	All general building fans shall be shut down.		
f.	The elevator (if any) shall recall to First Floor.		
g.	Automatic magnetic doors close.		
h.	Stairwell and elevator pressurization fans (if any) shall start.		
5.	Verify operation of key-operated silencing switch located adjacent to fire alarm panel.		
6.	Reset fire alarm panel and water flow switch. Verify system's return to normal.		
7.	Initiate an alarm from all smoke detectors. Verify the following occurs.		
a.	An audible evacuation alarm shall sound a continuous alarm through the indication devices. Voice evacuation system (if any) shall operate.		
b.	The visual evacuation alarm devices (strobes) shall flash rapidly.		
c.	The master fire alarm control panel shall notify the fire department.		
d.	Appropriate zone shall be annunciated at main fire alarm control panel and annunciator (if any).		
e.	All general building fans shall be shut down.		
f.	The elevator (if any) shall recall to First Floor.		

		FIRE ALARM MANUFACTURER	ELECTRICAL CONTRACTOR
g.	Automatic magnetic doors close.		
h.	Verify operation of key-operated silencing switch located adjacent to fire alarm panel.		
i.	Reset smoke detector and fire alarm panel. Verify systems return to normal.		
j.	Functional performance test complete.		

C. Trouble Signal Testing:

1.	Close each sprinkler system valve with a tamper switch, when applicable, and verify proper supervisory alarm at the FACP.		
2.	Open each initiating device circuit and verify that the trouble signal activates.		
3.	Open and short circuit each signaling line circuit and verify that the trouble signal activates.		
4.	Open and short circuit each notification appliance circuit and verify that the trouble signal activates.		
5.	Individually ground each circuit and Verify response of trouble signal.		

3.17 TAGS

A.	Verify that all tags required by Texas State Fire Marshal are properly installed in all locations.		
B.	Batteries shall have date tag, dated at installation date with instructions.		

		FIRE ALARM MANUFACTURER	ELECTRICAL CONTRACTOR
3.18	**DOCUMENTATION AND TRAINING**		
A.	Verify shop drawings, as-builts, and submittals are complete.	_____	_____
B.	Verify O&M Manuals are complete.	_____	_____
C.	Verify warranty periods on all equipment.	_____	_____
D.	Verify Owner training is complete.	_____	_____
E.	Documentation and training complete.	_____	_____

3.19 STATEMENT OF BID

A. This statement may require certain work that is not currently specified, but in no way is it intended to change the specifications except that items or equipment listed herein shall supersede the specifications if there is a conflict between this statement and the specifications. All sections of the specifications will require compliance along with the work indicated in this bid statement. Fire Alarm Contractor shall submit this statement to the Electrical Contractor who shall include it in his bid. All items shall be answered.

I have read and acknowledge the plans and specifications for the project provided, as listed in Specification Section 28 3000 – FIRE ALARM SYSTEMS. We agree to provide, submit, and install the fire alarm system as listed below, but not limited to, upon award of the contract:

Please mark "YES" to acknowledge each item listed.

1. _____ Provide a "Farenhyt" IFP-300 Fire Alarm Control Panel, located as shown on the plans.

2. _____ Provide "Silent Knight" power supplies as required and specified.

3. _____ Provide "Farenhyt" manual pull stations as required and shown on the plans.

4. _____ Provide a "Farenyt" smoke or heat detectors with base as shown on the plans as specified. Heat detectors are preferred in dirty areas or food preparation areas. OWNER reserves the right to change device type by location requirements.

5. _____ Provide "Farenhyt" duct-mounted smoke detectors with all required hardware shown on the plans and ceiling tile tags.

6. _____ Provide “Farenhyt” monitor modules to tie in kitchen hood suppression system.

7. _____ Provide a system-wired Class A redundant loop for addressable devices with isolation modules and cable routing separation, and Class B for notification as specified and per NFPA and International Fire Code.

8. _____ Provide two-year warranty on all labor and parts for the entire system.

9. _____ Provide dedicated electrical circuits and EDCO surge protection for each fire alarm control panel, power supplies, boosters, digital communicators, and all other required control equipment per Owner standards and as specified.

10. _____ Provide device labeling, cable labeling, and system labeling to meet Owner standards, BICSI standards, and as specified. All labels will be machine printed, and securing fastened. All addressable devices will have label clearing mounted on the outside of the device, and visible from a minimum of 10’-0”.

11. _____ Provide on-site factory training for three (3) Owner employees as specified.

12. _____ Provide all technical manuals, code keys, and software (including proprietary) required to maintain system as specified.

13. _____ Provide fire stopping, penetration, and coring per UL listed methods and as specified to match barrier’s fire rating.

14. _____ Provide a letter from “Silent Knight” stating that Contractor is an authorized factory trained “Farenhyt” dealer, and authorized to install in the area the project is located. The letter must be signed by Brian Griffin-Silent Knight Regional Manager.

15. _____ Provide a copy of the Contractor’s Fire Alarm Certificate of Registration for sales, service, and installation of fire alarm and fire detection systems issued by the State Fire Marshal.

16. _____ Provide a copy of the Fire Alarm Superintendent’s NICET Level III license who will be supervising the fire system installation.

17. _____ Cable routing, installation, and support shall be per NFPA, NEC 760, and Texas Insurance Board. Owner wiring and support standards also apply and may be more stringent than acceptable industry standards. Provide cable routing and support as specified.

18. _____ Read specifications and noted that “T” tapping is unacceptable and will not be permitted.

19. _____ Provide additional devices as specified. Credit or the equipment will be given to Owner that remains unused.

20. _____ Final acceptance will be approved by Owner. AHJ acceptance is not considered acceptance by Owner. Owner will provide a letter to authorize final payment upon acceptance.

21. _____ I, the undersigned have read and understood all Bid and Contract Documents and have provided a proposal in accordance with the Bid Documents.

22. _____ I, the undersigned have coordinated the bid with the Electrical Contractor with regard to required 120 volt dedicated circuits, TVSS units, boxes, etc., that are required by the Electrical Contractor to furnish and install; and which items are not indicated on the drawings.

Date: _____
Bidder: _____
Company Name: _____
Signed name typed: _____
Signature in Ink: _____
Title: _____
Address: _____
_____
Phone: _____
Texas Fire Alarm License #: _____

END OF SECTION

SECTION 28 3100
INTRUSION DETECTION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Related Documents: Division 00 – Procuring and contract documents, General and Supplementary Conditions of the Contract, Division 01 General Requirements.

B. 28 0511 Cyber Security Requirements.

C. 28 1300 Access Control.

D. Manufacturer Cyber Security Guidelines.

1.02 SUMMARY

A. Section includes:
1. Provide and install a new intrusion detection system (IDS) for the new facility to include new motion detectors, keypads, panels, and all wiring. Door position switches shall be provided under the access control system (ACS). The intrusion system shall be wired to those door position switches. Coordination with the ACS contractor shall be required.
2. The intrusion system shall also be integrated with the access control system so that a valid credential read by the ACS results in the disarming of the IDS.

B. Related Requirements – Contractor shall comply with current releases of the following:
1. TIA 569 C– Telecommunications Pathways and Spaces
2. ANSI/TIA/ 606-B – Administration Standard for Commercial Telecommunications Infrastructures
3. ANSI/TIA-862-A – Building Automation Systems Cabling
4. International Standards Organization (ISO) 7816
5. Underwriters Laboratories (UL®) Cable Certification and Follow up Program
   a. 464-09 Audible Signal Appliances
   b. 609-96 Local Burglar Alarm Units and Systems
   c. 634-07 Standards for Connectors with Burglar-Alarm Systems
   d. 639-07 Standards for Intrusion Detection Units
   e. 1037-09 Standard for Anti-theft Alarms and Devices
   f. 1635-10 Digital Alarm Communicator System Units
6. National Electrical Manufacturers Association (NEMA)
7. American Society for Testing Materials (ASTM)
8. National Electric Code (NEC®),
9. Institute of Electrical and Electronic Engineers (IEEE)
10. UL Testing Bulletin
11. American National Standards Institute (ANSI)/Security Industry Association (SIA):
12. Passive Infrared Motion Detector Standard - Features for Enhancing False Alarm Immunity
13. Control Panel Standard-Features for False Alarm Reduction
14. Department of Justice American Disability Act (ADA) ADA Standards for Accessible Design
15. Federal Communications Commission (FCC)
16. National Fire Protection Association (NFPA):
    a. 70-11 National Electrical Code
    b. 731-08 Standards for the Installation of Electric Premises Security Systems
17. Underwriters Laboratories, Inc. (UL):

1.03 DEFINITIONS

A. Alarm Signal: Display at central-station control unit and actuate audible and visual alarm devices.

B. Controller: An intelligent peripheral control unit that uses a computer for controlling its operation. Where this term is presented with an initial capital letter, this definition applies.

C. Provide: As used herein shall mean "furnish, install, label and test (if applicable) complete."

D. Infrastructure: As used herein, it shall mean j-hooks, conduits, sleeves, and raceways with all required accessories; completely installed.

E. Work: As used herein shall be understood to mean the materials completely installed, including the labor involved.

F. ACS: Access control system

G. DPS: Door position switch

H. IDS: Intrusion detection system

I. I/O: Input/Output.

J. Intrusion Zone: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.

K. LED: Light-emitting diode.

L. NEC: National Electric Code

M. NEMA: National Electrical Manufacturers Association

N. NFPA: National Fire Protection Association

O. NRTL: Nationally Recognized Testing Laboratory.

P. PIR: Passive infrared.

Q. RF: Radio frequency.

R. Supervision: System components shall be continuously monitored for normal, alarm, supervisory, and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.

S. Supervisory Condition Signal: Distinct from other signals, indicating an abnormal condition as specified for the device or controller.

T. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signals shall indicate system problems such as battery failure, open or short transmission line conductors, or controller failure.

U. UPS: Uninterruptible power supply.

V. VMS: Video Management system

W. WAN: Wide area network.

1.04 PERFORMANCE REQUIREMENTS

A. The Contractor shall provide and pay for all materials, supplies, machinery, equipment, tools, superintendence, labor, services, insurance, and all water, fuel, transportation, and other facilities necessary for the execution and completion of the work covered by the Contract Documents.

B. Unless otherwise specifically provided in this Contract, all equipment, material, and articles incorporated in the work covered by this Contract are to be new and of the most suitable grade for the purpose intended.

C. All work under this Contract shall be performed in a skillful and professional manner. The Contractor agrees to employ only orderly and competent employees, skillful in the performance of the type of work required under this contract; and agrees that whenever informed by the Owner in writing that any employee(s) on the work is (are), in its opinion, incompetent, unfaithful or disorderly, shall be discharged from the work and shall not again be employed on the work without the Owner's written consent.

D. Materials or work described in words, which so applied, have a well-known technical or trade meaning shall be held to refer to such recognized standards. Neither custom nor usage of trade shall require the Owner to accept materials or workmanship not in strict and complete compliance with the Contract Documents.

E. The Owner makes no representations as to the accuracy or completeness of the site information furnished to the Contractor by the Owner and does not expressly or impliedly warrant same and is not responsible for any interpretations or conclusions reached by the Contractor with respect thereto. It is Contractor's sole responsibility to verify to its own satisfaction all site information.

F. The Contractor is responsible for having visited the site and ascertained pertinent local conditions such as location, accessibility, and character of the site or building, the character and extent of existing work within and adjacent to the site, and any other work being performed thereon at the time of the submission of his proposal. Any failure to do so will not relieve him of responsibility for successfully performing the work without additional expense to the Owner.

G. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported to the Owner at once.

H. If in the performance of the Contract, subsurface, latent, or concealed conditions at the site are found to be materially different from the information included in the specification and the resulting Contract Documents, or if unknown conditions of an unusual nature are disclosed differing materially from the conditions usually inherent in work of the character shown and specified, the Owner shall be notified in writing of such conditions before they are disturbed. A/E, with the approval of the Owner, will promptly make such changes the Specifications as deemed necessary to conform to the different conditions, and any increase or decrease in the Work, or in the time within which the Work is to be completed, resulting from such changes will be adjusted by Change Order subject to the prior approval of the Owner.

I. Before submitting its proposal to the Owner, and continuously after execution of the Contract, the Contractor shall carefully study and compare this specification and shall at once report to the Owner any error, inconsistency, or omission the Contractor may discover, including any requirements which may be contrary to any law, ordinance, rule, regulation, or order of any public authority bearing on the performance of the work. By submitting its proposal for the Contract and the Work, the Contractor agrees that the specification and resulting Contract Documents appear accurate, consistent, and complete as far as can be determined. If the Contractor has reported in writing an error, inconsistency, or omission, has promptly stopped the affected work until otherwise instructed, and has otherwise followed the instructions of the Owner, the Contractor shall not be liable to the Owner for any damage resulting from any such errors, inconsistencies or omissions in this specification and resulting Contract Documents. The Contractor shall perform no portion of the Work at any

time without the Contract Documents and, where required, approved Project Drawings, Product Data or Samples for such portion of the Work.

J. The Contractor shall perform the Work in accordance with the Contract Documents and submittals.

K. The Contractor shall arrange for the securing of all necessary permits and pay for same.

1.05 CONTRACTOR QUALIFICATIONS

A. Acceptable Manufacturers
   1. Napco

B. Contractor
   1. Bidders who do not currently possess the necessary qualifications, trained and experienced personnel, financial capacity, current state licenses (as required by the Texas Department of Public Safety Private Security Bureau), and meet the other requirements herein described will be disqualified.
   2. The Contractor, as a business entity, shall be an authorized and designated representative/Dealer of the equipment used in this specification, with full warranty privileges, and shall have been actively engaged in the business of selling, installing, and servicing surveillance systems for a period of at least three (3) years The Contractor, as a business entity, shall have successfully installed a minimum of three similar-sized systems that are currently operating to the Owner's satisfaction.
      a. Integrators must be certified by the manufacturer to bid on this work.
         1) Contractors who are in the process of becoming certified with the specified manufacturer may not be selected.
   3. The preferred Contractor will have a minimum of five (5) years of surveillance / video management system installation experience with K-12 schools in Texas.
   4. The Contractor will comply with all federal, state, and local statutes regarding qualifications of firms.
   5. The Contractor will have adequately trained personnel in the usage of such tools and equipment and will provide a quantity of certified technicians as part of their submittal response.
   6. The Contractor must have previously established offices located within 120 miles of the Owner's Administration Building.
   7. The Contractor shall not have any grievances or complaints of record regarding workmanship, code compliance or service response. A Contractor that has any prior finding(s) of a license violation or has any litigation in process is unacceptable.
   8. The Owner reserves the right to reject bid of any bidder who has previously failed to perform properly, or complete on time, contracts of a similar nature.

C. Subcontractors
   1. The use of qualified sub-Contractors to an unqualified security Contractor for this project is not approved.

1.06 SUBMITTALS

A. No portion of the work shall commence, or equipment ordered until the architect, consultant, and engineering team (A/E) and Owner have approved the submittals.

B. Successful Contractor shall submit an electronic PDF copy of the submittal package within 15 days of written notification to proceed or other written documentation from the Architect or General Contractor. Documents shall be broken by the following:

C. Action Submittals
   1. Provide manufacturers cut sheets for each piece of equipment specified. Include the manufacturer name, model number and description of each listed component.

a. In cases of multiple product numbers on a single cut sheet, the Contractor shall identify the proper part number with a cloud or highlight.

2. Shop drawings are required for the submittal package and will contain the following information:
   a. Indicate the location of each device as it appears inside the building. Devices shall include all cable pathways, motion sensors and other devices associated with the intrusion alarm system.
   b. Each device shall be labeled as per the direction of the Owner representative.
   c. Line diagram drawings indicate the connecting points for all devices inside the panel.
3. No portion of the work shall commence, or equipment ordered until the architect, Owner Representative and Owner have approved the submittals.

D. Informational Submittals
1. Provide a copy of current manufacturer's certifications for the company and for all personnel who will provide services on this project.

E. Closeout Submittals
1. Contractor shall be furnished with either a set of CAD files or the Revit model to use for record drawings.
2. Maintenance Data: Include manufacturers' operating instructions, original copies of all software, recommended maintenance required and maintenance intervals.
3. A complete parts list of additional materials provided as attic stock – if applicable.
4. Drawings
   a. Show all final wiring pathways.
   b. Update the original submittals of the floor plans. Relocate any device that may have been moved or altered.
   c. Each device shall be labeled as per the direction of the Owner representative.
   d. Update the line diagram drawings provided during the submittal phase that indicate device locations inside the alarm panel.
5. Drawings will contain the contractors' own title block on the edge of the drawing. The title block shall contain the following information and adhere to the following requirements.
   a. Company name
   b. Company address and phone number for service
   c. Date on the drawings will match the date of acceptance for warranty purposes
   d. Do not use any part of the consultant / architect title block, copyright data or seals. Failure to remove these items will result in the document being returned stamped revise and resubmit.
6. Drawings will be issued in PDF format.
7. Provide all drawings in black and white. Do not provide electronic drawings in color.

F. Drawings shall be provided to the A/E for review and acceptance prior to the Owner's final acceptance of the project.
1. The drawings will be reviewed with the A/E and the Owner prior to the final acceptance process. Drawings rejected for any reason will delay the final acceptance process until resolved.
2. Completed record drawing will be required for use during the final acceptance process of the construction project. Failure to produce the record drawing during this process will result in a delay in the final acceptance of the project.

1.07 QUALITY ASSURANCE

A. Contractors shall have a documented quality assurance program. This program shall have internal inspection team(s) to measure the service and product quality produced by the Contractor's technicians against internal and Industry standards.

1.08 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of the delivery storage and handling specification sections in the project specification book.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Stored materials shall be protected from exposure to harmful environmental conditions and at temperature conditions recommended by manufacturers.

D. Handle products and systems in accordance with manufacturer's instructions.

E. Contractors are required to remove all empty containers and other trash associated with the system. This includes all packaging, excess cable and other materials that hold no value to the Owner.

1.09 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
   2. Do not begin installation until instructed to perform by the Owner Construction Manager at Risk.
   3. While on campus or on any land owned by The Owner all Contractors will comply with Owner policies concerning alcohol, tobacco, and firearms as well as any other Owner policy governing dress, behavior etc.

1.10 COORDINATION

A. Single Point of Contact / Project Manager
   1. Contractor shall provide a single point of contact, i.e., Project Manager, to speak for the Contractor and to provide the following functions:
      a. Initiate and coordinate tasks with the Owner Technology Projects Manager, its General Contractor, Architect, and others as specified by the Architect or General Contractor.
      b. Provide day-to-day direction and on-site supervision of Contractor personnel.
      c. Ensure conformance with all Contract provisions.
   2. If the Project manager is unable to remain continuously on site a project, Forman shall be required to remain. The project supervisor shall be responsible for day-to-day activities and reporting all status to the Project Manager.

B. Technical Support
   1. Contractor shall provide technical support consisting of two technicians for a full working day when Owner deems necessary during the physical move to the site.
   2. The personnel providing technical support shall:
      a. Have intimate knowledge of the system and materials that were used.
      b. Be skilled in all use of equipment and materials used under the Contract.
      c. Be competent to troubleshoot and fix problems associated with Contractor provided materials.
      d. Have the test equipment, tools, and materials needed to troubleshoot and remediate problems associated with Contractor provided materials and installation.

C. The contractor shall not coordinate directly with the Owner or Consultant unless permission has been given by the General Contractor and Architect.

D. All coordination shall be documented in writing in a format approved by the Architect.

E. Coordination of site walks, overheads, finals must be coordinated with the General Contractor and Architect with a minimum of five (5) business days' notice that a system is ready for review by the Consultant.

1.11 WARRANTY

A. The Contractor warrants to the Owner that all materials and equipment furnished under this specification will be new unless otherwise specified, and that all Work will be of superior quality, free from faults and defects and in conformance with the specification. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

B. The Contractor warrants the materials, workmanship, and work to be in conformance with the Contract Documents included in this Project, for one full year from the approved substantial completion date unless a longer warranty or special guarantee is specified. Contractor shall assign to Owner all warranties and guarantees from or rights against any manufacturer, supplier or distributor of equipment, fixtures and other material installed in or incorporated in the Work at the time of Acceptance by Owner.
   1. Contractor Labor Warranty Period: One (1) year after date of Final Acceptance.
   2. Product Warranty Period: Ten years after the purchase date of equipment.

C. The Warranty binds the Contractor to correct any work that does not conform to such Contract Documents or any defects in workmanship or materials furnished under this Contract which may be discovered within the one-year period. The Contractor shall, at its own expense, correct such defect after receiving notice from the Owner by repairing same to the condition called for in the Contract Documents.

D. Contractor shall warrantee the repaired/replacement item for one year from date of repair/replacement. This warranty shall cover parts, labor, travel, and all other expenses.

E. All replacement, installation, integration, maintenance, and testing provided in conjunction with the warranty provisions of such contract will be provided at no additional cost to the Owner.

F. Additional Warranty
   1. Contractor will state any additional Contractor supplied warranty.

G. Contractor shall provide the Owner with a list of all contact information for warranty purposes to include phone numbers, email addresses and business and technical support hours.

H. All recall notices occurring during the manufacturer's warranty period will automatically be forwarded to the Owner.

I. All recall notices occurring after the expiration of the manufacturer's warranty will be forwarded to the Owner for a period of 2 years after the warranty expires.

J. Service Under Warranty
   1. Warranty service shall be on a 24-hour/day, 365-day/year basis with a response time not to exceed four hours. The respondent shall certify that its proposed service facility shall initiate, within one business day, on-site repair to any critical system product that fails while under warranty.
   2. Upon receipt of written notice, Contractor shall remedy defects within two calendar days, or the Owner shall seek other means to correct the defects and the Contractor, or its surety shall be liable for expenses.
   3. If it becomes necessary for the Owner to contract out for warranty repairs, due to an inability or failure of the Contractor to perform such repairs, the Contractor shall reimburse the Owner for all invoices for parts, labor, materials, travel, per-diem, and all other related expenses such as shipping/handling costs to perform such repairs,

within 30 days from presentation of an invoice from the Owner. This shall only occur after the Contractor has been given two calendar days to respond and correct the problem. The cost limit for such repairs will not exceed the actual costs as listed above, which are related to the repairs.

PART 2 - PRODUCTS

2.01 PANELS AND ENCLOSURE

A. Acceptable manufacturer: Napco
   1. GEM-X255 with IP module and cellular communication.

2.02 EXPANSION MODULES

A. Acceptable manufacturer: Gemini
   1. GEM-EZM8

2.03 POWER SUPPLY

A. Acceptable manufacturer: Altronix
   1. AL400ULX in grey enclosure.
   2. Include two 12V 7Ah batteries with the supply.

2.04 KEYPADS

A. Acceptable manufacturer: Napco
   1. RP3000LCD

2.05 MOTION DETECTORS

A. Acceptable manufacturer: Bosch
   1. DS 9360 - Ceilings
   2. DS 778 - Walls

2.06 DOOR POSITION SWITCHES

A. Door Position Switches will be part of the access control system and intrusion system, DPDT. Reference access control specifications for part numbers.

B. The contacts will be provided and installed by the access control contractor. Contractors shall provide wiring and make connectivity to the DPS, in coordination with the access control contractor, for the IDS system.

C. Roof hatch contacts shall be afforded the same connectivity as the door position switches and shall be provided and installed by the access control contractor with the intrusion system contractor connecting their own wiring in coordination with the access control contractor.

2.07 CARD READERS

A. The access control contractor shall provide and install card readers adjacent to the IDS keypads inside the facility and connect them to a controller on the access control system (ACS) system. The ACS contractor shall provide a connection from the ACS panel to the IDS panel for the purpose of allowing the IDS to be armed from the reader at the keypad location.

B. Exterior card readers shall be connected to the IDS in the same way, to allow for the disarming of the IDS.

C. IDS contractor shall ensure that there is enough input at the IDS panel(s) to accept these connections and to make any final physical connections required for the IDS inside the IDS panel and/ or via configuration of the IDS programming.

2.08 WIRE & CABLE PATHWAYS

A. All unshielded shielded, multi and single conductor wiring shall be sized by manufacturer guidelines.

B. Wiring in the bay areas shall be installed in conduit provided by Div 26. Cable jackets for these areas shall be rated for wet environments.

C. Cabling shall be rated for plenum environments in all office areas with acoustic ceilings.

D. Pathways shall consist of J-Hooks above all accessible ceiling spaces. Conduit and back boxes shall be installed in the bay areas by Div 26.

2.09 NON-CONTINUOUS CABLE SUPPORTS (J-HOOKS)

A. Acceptable manufacturer: Erico Caddy J-Hooks

2.10 MISCELLANEOUS EQUIPMENT

A. The Contractor will provide any necessary Velcro, J-Hooks, and support hardware, etc., necessary to facilitate the installation of the System.

2.11 TRAINING

A. No training is required.

PART 3 - EXECUTION

3.01 SECURITY CABLE PATHWAYS AND SPACES

A. Wiring color codes will be strictly observed, and terminations will be uniform throughout the system.

B. Identification markings and systems will be uniform with machine generated labels.

C. No J-Hook may be secured to the drop ceiling grid support wire. Contractors installing their support devices to the grid wire will replace the assembly with no cost to the client, the Architect, or the General Contractor.

D. If Contractor installs drop wire for pathway support devices, installation must comply with all NEC requirements including attaching both ends of drop wire as well as color-coded securing clips. Contractor is responsible for all damage and/or interference of other building systems using this method and will remediate at Contractor’s sole expense.

E. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed.

F. Non-continuous cable supports sized 1 5/16” and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.

G. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.

H. Stainless Steel non-continuous cable supports are intended for indoor and outdoor use in non-corrosive environments or where only mildly corrosive conditions apply.

I. Assemble beam clips, flange clips, C and Z purlin clips per manufacturer direction.

J. Pathways shall not be attached to or supported by fire sprinkler heads or delivery systems, or any environmental sensor or mechanical ductwork or other pathway located in the ceiling air space including duct work.

K. Cable bundles shall be supported via J-Hooks and/or saddles/slings attached to the building structure and framework at a maximum of five (5) foot intervals.

L. The Contractor shall not install any cable pathways above an electrical room.

M. Pathways shall not be parallel to electrical pathways without proper separation.

N. Each J-Hook shall contain only one type of transmission media. Do not share pathways with other trades.

O. Sleeves
   1. Cable pathway sleeves shall consist of properly sized sleeves, equipped with bushings on both sides for all fire wall penetrations. Div 26 shall install conduit sleeves and pathways.
   2. Do not install wiring in any sleeve that is not equipped with protective bushings.
      a. Any anticipated delay in cable installation because of conduit or conduit bushing installation shall immediately be brought to the attention of the General Contractor.
   3. Use of sleeves pre-loaded with fire stop, such as the STI EZ Path, Flamestopper through wall fittings is approved for use in all firewall locations. These devices do not need to be used in areas where firewalls are not being used. This includes all sleeves over hard ceilings, exposed ceilings etc. Product shall be installed prior to cable installation for protection of cables.
      a. Cables installed prior to firestop system shall be removed and reinstalled at Contractor's sole expense.
   4. Firestop all sleeves to meet wall rating for flame and water stream tests.
   5. Contractor shall coordinate with electrical contractor for final pathway support to include but not limited to, sleeves, conduits through exposed ceiling spaces etc.

P. Cables shall not be attached to lift out ceiling grid supports or laid directly on the ceiling grid or tiles.

Q. Cables shall not be attached to or supported by fire sprinkler heads or delivery systems or any environmental sensor located in the ceiling air space including duct work.

R. Each cable between the panel and the device shall be continuous without any joints or splices.

S. Plastic tie wraps are not permitted in the overhead cable pathway but may be used inside the panels.

3.02 DEVICE INSTALLATION

A. Main security system panel:
   1. Locate the main system panel in the MDF at locations shown in the technology drawings.
   2. Size the panel based on the number of keypads, motion sensors, door contacts and audible alarm requirements based on these specifications and as shown on the plans.
   3. Panel can communicate over standard analog communications or via the Owner LAN/WAN. The contractor will specify which communication solution will be provided with the system.

B. Auxiliary power supply:
   1. Provide as required auxiliary power supply(s) and battery backup, U.L. Listed, and labeled for burglary alarm systems.
   2. The filtered and electronically regulated power output supply/charger and batteries shall supply additional power limited 12 VDC operating and emergency power to the system when the load from detectors or local alarms exceeds the capability of the power supply built in the main panel. Power supply shall provide a minimum output of

four amps at 12 VDC. Provide AC power failure and low battery reporting. Provides low battery disconnect. Standby battery operation time shall equal, or exceed, the standby operation time of the main panel; in any case, provide a minimum of 13-amp hours battery backup.

3. Provide a U.L. Listed cabinet suitable for surface mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and a painted standard finish. The back box and door shall be constructed of 0.060" minimum steel with provisions for electrical conduit connections into the sides and top. The cabinet shall provide storage for backup batteries. The door shall provide a key lock to access system components, key alike with main panel. The cabinet shall be attack resistant and fitted with front and back tamper switches. All components shall be securely mounted, and all cable routed, and tie wrapped in a neat, professional manner.
4. Electrical Contractor shall provide power through a 120 VAC, 20-ampere breaker from spares scheduled in nearest panel.

C. Keypads:
1. Provide keypads for arming and disarming the security system.
2. System LCD keypad (s) shall be powered from the base panel via the four-wire communications bus. Control keys shall be backlit for low light level ease of use. Keypads shall have the capability to operate in power-save mode in the event of a power failure.
3. Keypad shall be surface-mounted. Electrical will provide conduit and flush mount back boxes at all keypad locations.
4. The system will be integrated with the access control system. The card readers at the exterior door locations will disarm the system. The card readers adjacent to the keypads will arm the system.

D. Motion Sensors:
1. Align motion sensors to provide coverage to all personnel and roll up door entry points.
2. Install on manufacturer approved mounting brackets/ gimbal mounts to achieve proper coverage.
3. Ceiling mounted devices will not rely on the ceiling tile for support.
4. Detectors will be positioned so that movement outside the building will not trip false alarms.

E. Door Position Switches:
1. Contractor shall wire the door contacts provided by the access control contractor.
2. Door position switches will connect to both the Intrusion system and the Access Control system. This includes roof hatch locations.

3.03 PROGRAMMING

A. Before installation of the system, the Contractor shall coordinate with the Owner for the following:
1. System network settings, including IP addressing, VLANs, firewall ports, et.al.
2. Anti-virus, anti-malware and other prevention and detection tools on servers and client machines
3. Operating system versions and patch levels on servers and client machines
4. Needs and methods for allowing remote access
5. Password provisioning plan. No devices shall be deployed using their manufacturer default passwords.
6. An asset management worksheet, to include:
   a. Manufacturer, model, and firmware or software version
   b. Device logical names
   c. Serial number and MAC address, if applicable

d. Network settings, including IP address, VLAN or subnet mask, default gateway
e. Equipment location
f. Device usernames and passwords

B. The Contractor and its authorized installers shall:
1. Complete the Owner-approved asset management worksheet.
2. Synchronize security devices with a common time base acceptable to the Owner.
3. Disable all services and ports not required for ongoing system operation, including ICMP and discovery protocols (subject to Owner's standards).
4. Provision device and system privileges in a manner approved by the Owner.

C. Ensure only secure versions of all protocols are used, including HTTPS, SFTP, SNMP v3.

D. Reference closes out requirements in section one of these specifications for additional requirements.

3.04 TESTING AND FINAL ACCEPTANCE

A. A factory-trained representative of the manufacturer shall supervise the final connections and testing of the system, and it shall be subject to the final acceptance of the Architect/Engineer and Owner.

B. The Security System Contractor shall make a thorough inspection and test of the completely installed security system including all components such as motion detectors, and controls, to ensure the following:
1. Complete and functional system Installed in accordance with manufacturer's instructions
2. Confirm at the panel, with an ohmmeter, that each zone has a functioning end of line resistor.
3. Each of the alarm conditions that the system is required to detect should be introduced on the system, including disconnection to the telephone line
a walk test to confirm that each detector is located and properly aimed for the intended coverage area
4. Verify that all tripped devices display the correct zone identification at the keypads
5. Verify the proper processing of the signal at the panel and the correct activation of local alarms and the digital communicator.
6. Verify the access control system can disarm the intrusion system from any card reader inside the building. This does not include card readers located at the vehicle or exterior personnel gates.

C. Labeling
1. System components and wiring shall be comprehensively labeled.
2. All labels shall be machine generated with wrap around labels.
3. Handwritten labels are not acceptable.
4. Labeling shall match the provided record drawings and will be reviewed on site with the Owner and Owner's representative.

END OF SECTION

Huckabee MORE THAN ARCHITECTS