PROJECT MANUAL

Amy Park Heath Elementary Outdoor Learning Center
Rockwall Independent School District
Heath, Texas
TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 0115  LIST OF DRAWING SHEETS  2
00 2116  INSTRUCTIONS TO PROPOSERS  2
00 7343  WAGE RATE REQUIREMENTS  4

DIVISION 01 - GENERAL REQUIREMENTS

01 1100  SUMMARY OF WORK  1
01 1400  WORK RESTRICTIONS  1
01 3000  ADMINISTRATIVE REQUIREMENTS  17
01 3216  CONSTRUCTION PROGRESS SCHEDULE  6
01 4000  QUALITY REQUIREMENTS  3
01 4100  REGULATORY REQUIREMENTS  2
01 4516  CONTRACTOR’S QUALITY CONTROL  3
01 4533  CODE-REQUIRED QUALITY CONTROL  12
01 5000  TEMPORARY FACILITIES AND CONTROLS  3
01 6000  PRODUCT REQUIREMENTS  8
01 7000  EXECUTION AND CLOSEOUT  13
01 7800  REQUIREMENTS CLOSEOUT SUBMITTALS  7

REFERENCE DRAWING SHEET S1.01 FOR STRUCTURAL SPECIFICATIONS

DIVISION 02 - EXISTING CONDITIONS

02 4100  DEMOLITION  3

DIVISION 03 - CONCRETE

03 3490  GLASS FIBER REINFORCED CONCRETE  5

DIVISION 04 - MASONRY

04 0511  MORTOR AND MASONRY GROUT  5
04 2000  UNIT MASONRY  13

DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

06 1000  ROUGH CARPENTARY  7

DIVISION 07 - THERMAL AND MOSITURE PROTECTION

07 2100  THERMAL INSULATION  5
07 4110  STANDING SEAM ROOF  12

DIVISION 08 - OPENINGS

08 1113  HOLLOW METAL DOORS AND FRAMES  6
08 7100  DOOR HARDWARE  15
**DIVISION 09 - FINISHES**

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
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<td>09 9300</td>
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**PLUMBING**

**DIVISION 22**

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<td>Plumbing Submittal Procedures</td>
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<td>22 05 24</td>
<td>Valves - General</td>
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<td>22 05 30</td>
<td>Pipe And Pipe Fittings - General</td>
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<td>22 07 20</td>
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<tr>
<td>22 13 17</td>
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**HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)**

**DIVISION 23**

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<td>Identification For HVAC Piping And Equipment</td>
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<td>HVAC Fans</td>
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<td>23 82 39</td>
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**ELECTRICAL**

**DIVISION 26**

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<td>Electrical Submittal Procedures</td>
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<td>Grounding And Bonding for Electrical Systems</td>
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<td>26 05 33.11</td>
<td>Raceways And Conduits for Electrical Systems</td>
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<tr>
<td>26 05 33.13</td>
<td>Boxes And Fittings for Electrical Systems</td>
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<tr>
<td>26 05 53</td>
<td>Identification For Electrical Systems</td>
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<tr>
<td>26 08 11</td>
<td>Testing of Electrical System</td>
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<tr>
<td>26 09 41</td>
<td>Lighting Controls</td>
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<tr>
<td>26 22 13</td>
<td>Low Voltage Distribution Transformers</td>
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<td>26 24 16</td>
<td>Panelboards For Distribution Switchgear</td>
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<tr>
<td>26 27 26</td>
<td>Wiring Devices</td>
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<td>26 28 13</td>
<td>Fuses</td>
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<td>26 28 16</td>
<td>Enclosed Safety Switches And Circuit Breakers</td>
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<td>26 50 00</td>
<td>Lighting</td>
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**END OF SECTION**

Strohmeyer Architects Inc
SECTION 00 0115
LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.01 SUMMARY
A. Following are the drawings which form a part of the contract, as set forth in subparagraph 1.1.1 of the accompanying "General Conditions of the Contract for Construction".

1.02 TITLE OF DRAWINGS:

SHEET INDEX

CS - COVER SHEET
G1.1 - CODE REVIEW

S1.01 - STRUCTURAL GENERAL
S2.01 - FOUNDATION PLAN/ROOF FRAMING
S3.01 - FOUNDATION DETAILS
S3.02 - FRAMING DETAILS
S3.03 - FRAMING DETAILS
S3.04 - FRAMING DETAILS

SP1.1 - OVERALL SITEPLAN
SP1.2 - SITEPLAN

A1.1 - FLOOR PLAN
A5.1 - ELEVATIONS
A6.1 - SECTIONS
A7.1 - ROOF PLAN
A8.1 - DETAILS

MP1.1 - MECHANICAL & PLUMBING FLOOR PLAN
EP1.1 - ELECTRICAL FLOOR PLAN
EP7.1 - ELECTRICAL DETAILS & SYMBOLS
EP7.2 - ELECTRICAL DETAILS

END OF SECTION
SECTION 00 2116
INSTRUCTIONS TO PROPOSERS

1.01 SEALED PROPOSALS

A. Sealed proposals addressed to D&D Commercial, Construction Manager for the Rockwall ISD - Amy Parks Heath Elementary Outdoor Learning Center, Heath, Texas, shall be received until 4:00 PM, TUESDAY, FEBRUARY 4, 2020. Proposals shall be delivered to the office at Amy Parks Elementary School, 330 Laurence Drive, Heath, Texas 75032. Proposals are for the furnishing of all labor, materials and equipment, and performing all work required for the project, and in compliance with the project manual and drawings, and other contract documents, as prepared by Strohmeyer Architects Inc.

B. There will be a Pre-Proposal Meeting held at 4:00 PM, TUESDAY, JANUARY 28, 2020 at Amy Parks Elementary School, 330 Laurence Drive, Heath, Texas 75032. Attendance is highly recommended.

C. 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 listed in Section 00 7343 Wage Rate Requirements.

D. 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.

E. 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.

F. 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.

G. 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.

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

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

J. 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.

K. 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.

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

N. 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.

O. No substitution will be considered unless written request has been submitted to the Architect for approval at least ten (10) 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.

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

Q. 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.

R. 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.

S. 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
WAGE RATES

A. 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, as follows:
2258.021. Right to be Paid Prevailing Wage Rates.
(a) A worker employed on a public work by or on behalf of the state or a political subdivision of the state shall be paid:
   (1) not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which
       the work is performed; and
   (2) not less than the general prevailing rate of per diem wages for legal holiday and overtime work.
(b) Subsection (a) does not apply to maintenance work.
(c) A worker is employed on a public work for the purposes of this section if the worker is employed by a contractor or
    subcontractor in the execution of a contract for the public work with the state, a political subdivision of the state, or any
    officer or public body of the state or a political subdivision of the state.

2258.023. Prevailing Wage Rates to be Paid by Contractor and Subcontractor; Penalty.
(a) The contractor who is awarded a contract by a public body or a subcontractor of the contractor shall pay not less than the
    rates determined under Section 2258.022 to a worker employed by it in the execution of the contract.
(b) A contractor or subcontractor who violates this section shall pay to the state or a political subdivision of the state on
    whose behalf the contract is made, $60 for each worker employed for each calendar day or part of the day that the
    worker is paid less than the wage rates stipulated in the contract. A public body awarding a contract shall specify this
    penalty in the contract.
(c) A contractor or subcontractor does not violate this section if a public body awarding a contract does not determine the
    prevailing wage rates and specify the rates in the contract as provided by Section 2258.022.
(d) The public body shall use any money collected under this section to offset the costs incurred in the administration of this
    chapter.
(e) A municipality is entitled to collect a penalty under this section only if the municipality has a population of more than
    10,000.

2258.051. Duty of Public Body to Hear Complaints and Withhold Payment.
A public body awarding a contract, and an agent or officer of the public body, shall:
(1) take cognizance of complaints of all violations of this chapter committed in the execution
    of the contract; and
(2) withhold money forfeited or required to be withheld under this chapter from the payments to the contractor under the
    contract, except that the public body may not withhold money from other than the final payment without a
    determination by the public body that there is good cause to believe that the contractor has violated this chapter.
<table>
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<tr>
<th>CLASSIFICATION</th>
<th>HOURLY RATE</th>
<th>NOTES</th>
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<td>Asbestos Worker</td>
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<tr>
<td>Bricklayers; Masons</td>
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<td>Carpenter/Caseworker</td>
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<td>Concrete Finishers</td>
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<td>Drywall/Ceiling Installers</td>
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<td>Light Equipment Operators</td>
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<td>Terrazzo Workers</td>
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<td>Water Proofers / Caulkers</td>
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This document was developed by PBK Architects, Inc. in strict accordance with the Texas Government Code Chapter 2258.
<table>
<thead>
<tr>
<th>Worker Classification</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Asbestos Worker</td>
<td>Worker who removes &amp; disposes of asbestos materials.</td>
</tr>
<tr>
<td>Carpenter</td>
<td>Worker who builds wood structures or structures of any material which has replaced wood. Includes rough &amp; finish carpentry, hardware and trim.</td>
</tr>
<tr>
<td>Carpet Layer/Floor Installer</td>
<td>Worker who installs carpets and/or floor coverings-vinyl tile.</td>
</tr>
<tr>
<td>Concrete Finisher</td>
<td>Worker who floats, trowels and finishes concrete.</td>
</tr>
<tr>
<td>Data Comm/Telecom Installer</td>
<td>Worker who installs data/telephone &amp; television cable and associated equipment and accessories.</td>
</tr>
<tr>
<td>Drywall/Ceiling Installer</td>
<td>Worker who installs metal framed walls &amp; ceilings, drywall coverings, ceiling grids &amp; ceilings.</td>
</tr>
<tr>
<td>Electrician</td>
<td>Skilled craftsman who installs or repairs electrical wiring &amp; devices. Includes fire alarm systems &amp; HVAC electrical controls.</td>
</tr>
<tr>
<td>Elevator Mechanic</td>
<td>Craftsman skilled in the installation &amp; maintenance of elevators.</td>
</tr>
<tr>
<td>Fire Proofing Installer</td>
<td>Worker who sprays or applies fire proofing materials.</td>
</tr>
<tr>
<td>Glazier</td>
<td>Worker who installs glass, glazing and glass framing.</td>
</tr>
<tr>
<td>Heavy Equipment Operator</td>
<td>Includes, but not limited to, all Cat tractors, all derrick-powered, all power operated cranes, back-hoe, back-filler, power operated shovel, winch truck, all trenching machines.</td>
</tr>
<tr>
<td>Insulator</td>
<td>Worker who applies, sprays or installs insulation.</td>
</tr>
<tr>
<td>Iron Worker</td>
<td>Skilled craftsman who erects structural steel framing &amp; installs structural concrete Rebar.</td>
</tr>
<tr>
<td>Laborer/Helper</td>
<td>Worker qualified for only unskilled or semi-skilled work. Lifting, carrying materials &amp; tools, hauling, digging, clean-up.</td>
</tr>
<tr>
<td>Lather/Plasterer</td>
<td>Worker who installs metal framing &amp; lath. Worker who applies plaster to lathing and installs associated accessories.</td>
</tr>
<tr>
<td>Light Equipment Operator</td>
<td>Includes, but not limited to, air compressors, truck crane driver, flex plane, building elevator, form grader, concrete mixer (less than 14cf), conveyer.</td>
</tr>
<tr>
<td>Mason</td>
<td>Craftsman who works with masonry products, stone, brick, block or any material substituting for those materials &amp; accessories.</td>
</tr>
<tr>
<td>Metal Building Assembler</td>
<td>Worker who assembles pre-made metal buildings.</td>
</tr>
<tr>
<td>Millwright</td>
<td>Mechanic specializing in the installation of heavy machinery, conveyance, wrenches, dock levelers, hydraulic lifts &amp; align pumps.</td>
</tr>
<tr>
<td>Painter/Wall Covering Inst</td>
<td>Worker who prepares wall surfaces &amp; applies paint and/or wall coverings, tape and bedding.</td>
</tr>
<tr>
<td>Pipefitter</td>
<td>Trained worker who installs piping systems, chilled water piping &amp; hot water (boiler) piping, pneumatic tubing controls, chillers, boilers &amp; associated mechanical equipment.</td>
</tr>
<tr>
<td>Plumber</td>
<td>Skilled craftsman who installs domestic hot &amp; cold water piping, waste piping, storm system piping, water closets, sinks, urinals, and related work.</td>
</tr>
<tr>
<td>Roofer</td>
<td>Worker who installs roofing materials, Bitumen (asphalt &amp; coal tar) felts, flashings, all types roofing membranes &amp; associated products.</td>
</tr>
<tr>
<td>Sheet Metal Worker</td>
<td>Worker who installs sheet metal products. Roof metal, flashings &amp; curbs, ductwork, mechanical equipment and associated metals.</td>
</tr>
<tr>
<td>Sprinkler Fitter</td>
<td>Worker who installs fire sprinkler systems &amp; fire protection equipment.</td>
</tr>
<tr>
<td>Terrazzo Worker</td>
<td>Craftsman who places &amp; finishes Terrazzo.</td>
</tr>
<tr>
<td>Tile Setter</td>
<td>Worker who prepares wall and/or floor surfaces &amp; applies ceramic tiles to these surfaces.</td>
</tr>
<tr>
<td>Waterproofer/ Caulker</td>
<td>Worker who applies water proofing material to buildings. Products include sealant, caulk, sheet membrane, liquid membranes, sprayed, rolled or brushed.</td>
</tr>
</tbody>
</table>
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 Amy Parks Heath Elementary Outdoor Learning Center for Rockwall ISD and is composed of renovations and related site work located in Heath, Texas.
   2. The "Work" of this Contract is titled Renovations to Amy Parks Heath Elementary Outdoor Learning Center and is defined in the Contract Documents to include, but not necessarily to be limited to:
      a. New pavilion, 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. Contractor shall be advised that the school will be operating during the duration of this
      project.
   2. Contractor shall coordinate with the Owner any activities which will disrupt normal school
      operations.
   3. 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.

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.
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.
1.04 SPECIAL CONDITIONS
   A. The successful Proposer will be furnished, free of charge, ten (10) copies of the Drawings and Project Manuals and will be furnished, at actual cost of reproduction born by the successful Proposer, as many additional copies as he may require.

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 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. It is Contractor's responsibility to submit documents in allowable format.
      3. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

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

B. 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
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 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. The approved Schedule of Values 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.
15. Other business relating to work.
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. Submittals to the Architect which are not listed below will not be reviewed by the Architect and will not be returned to the Contractor. Submittals required by specification section which are not listed in this section shall be reviewed by the Contractor.

B. The Architect’s review of the Contractor’s 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.

C. 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.

D. 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.

E. The Contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the project, but such data shall remain between the Contractor and his subcontractors and will not be reviewed by the Architect.

F. Where required by specification sections, provide submittals to the Contractor for review and approval. Contractor shall maintain a copy of all submittals at the project site.

G. Fax submittals are not acceptable.

H. Upon request by the Architect, Contractor shall submit additional items as required.
1. Only the following listed items shall be submitted to the Architect for review:
   a. Section 03 1000 – Concrete Forming and Accessories
      1) Shop Drawings - Construction joint plan
   b. Section 03 2000 – Concrete Reinforcing
      1) Shop Drawings - Anchor bolt setting plan
      2) Shop Drawings - Grade beam, and slab reinforcing steel
   c. Section 03 3000 – Cast-In-Place Concrete
      1) Concrete Mix Designs
      2) Accessory products - Documentation indicated section 03 3000
   d. Section 05 4000 – Cold-Formed Metal Framing
      1) Shop drawings with seal of professional engineer (Texas).
   e. Section 06 4119 - Manufactured Plastic-Laminate-Clad Casework
      1) Product Data – all components required per spec section.
      2) Shop Drawings – all components required per spec section.
   f. Division 07 - Thermal and Moisture Protection
      1) Product Data – all components required per spec section.
      2) Shop Drawings – all components required per spec section.
   g. Division 08 - Openings
      1) Product Data – all components required per spec section.
      2) Shop Drawings – all components required per spec section.
   h. Section 10 1400 – Signage
      1) Shop Drawings and sign copy layout
      2) Product Samples
i. Section 10 5100 – Lockers
   1) Product Data – all components required per spec section.
   2) Shop Drawings – all components required per spec section.

j. Section 11 3013 – Residential Appliances
   1) Product Data – all components required per spec section.

k. Divisions 21, 22, 23, 26, 27, 28
   1) Product Data – all components required per spec section.
   2) Shop Drawings – all components required per spec section.

2. Submit to Architect for review for the limited purpose of checking for compliance with
   information given and the design concept expressed in Contract Documents.
   3. Samples will be reviewed only for aesthetic, color, or finish selection.
   4. 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.
   b. Deliver physical sample submittals to Architect at 801 Cherry Street, Suite 500, Fort Worth, Texas 76102.
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 Autocad Cad file(s) at no charge within five (5) working days. 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: Cad Files 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: Cad Files and associated working plan views.
         1) Plan views contain overall and enlarged section plan view set up of floor plans, floor patterns, reflected ceiling and roof plans only. All plan views contain grids, dimensions, room names and general annotation.
         2) Reflected Ceiling Plans contain ceiling grids and types only. Lighting and Mechanical are provided as part of the MEP.
         3) Roof Plans contain grids and general annotation only. Mechanical is provided as part of the MEP.
         4) All details, detail annotation and references are omitted and not part of the model file.
      d. Mechanical, Electrical and Plumbing: Cad Files 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: Cad Files 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 Autocad file provided to the Awarded Prime Contractor is NOT FOR CONSTRUCTION PURPOSES, but for convenience only. This Cad Files 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 ROCKWALL 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 PARTY 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 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.
   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. The compiled data shall be submitted with the Contractor’s Construction Schedule for documenting future weather events.
   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
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
   B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2015.

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-furnished products and Owner furniture or equipment
scheduled for salvage and/or relocation in project.
K. Indicate testing of materials.
L. Indicate activity periods for punch list.
M. Indicate the work to be performed during the facility's scheduled holidays, weekends, or
summer recess periods.
N. Coordinate content with schedule of values specified in Section 01 3000.
O. 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 effect including 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 than 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
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.
   B. Energy Code Compliance
      2. Contractor shall provide, at the jobsite office, one copy of the completed energy code
         review.
   C. Accessibility Compliance
      1. Accessibility requirements are from the 2010 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

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.

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. Concrete mix design verification
   3. HVAC Testing and Balancing
   4. 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


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

A. Contractor's QA Laboratory Qualifications and Procedures:
   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 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.
3.04 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.

3.05 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.

3.06 MANUFACTURERS’ FIELD SERVICES
   A. See Section 01 4000 - Quality Requirements

3.07 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. 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.
      4. 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…)
      5. 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
   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 Rockwall ISD or Contractor.

G. 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. Design Professionals

H. 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.

I. 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. Design Professionals

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

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], Strohmeyer Architects Inc 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], Strohmeyer Architects Inc 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 Rockwall 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. 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 and/or tested shall be considered deficient and the Contractor shall issue an RFI to the Architect immediately when the Contractor becomes aware of this deficiency.

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

E. 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.

F. 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.
G. 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 and/or tests shall completely be the responsibility of the Contractor, at no additional cost to Rockwall ISD. Rockwall 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.

H. The Contractor shall pay for all re-inspections and re-tests 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.

I. 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. 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, Structural Engineer (or a representative of), 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 and tests 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 and CxA 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 and CxA 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 and Design Professional site visits for inspections and/or tests.
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 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 and CxA 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 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. 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 C231 or 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.

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 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.

3.06 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. Structural Engineer, Final Report of Structural Engineering Observations
         d. Mechanical Engineer, Final Report of Mechanical Engineering Observations
         e. 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], Strohmeyer Architects Inc 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], Strohmeyer Architects Inc 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 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], Strohmeyer Architects Inc 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. Field offices.

1.02 TEMPORARY UTILITIES
A. Owner will provide the following:
   1. Electrical power and metering, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.
B. Existing facilities may be used.
C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TEMPORARY SANITARY FACILITIES
A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
B. 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.

1.04 BARRIERS
A. Provide barriers to prevent unauthorized entry to construction areas. Protect 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.

1.05 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.

1.06 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.
1.07 INTERIOR ENCLOSURES
   A. Provide temporary partitions and ceilings as indicated to separate work areas from
      Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas,
      and to prevent damage to existing materials and equipment.
   B. Construction: Framing and plywood sheet materials with closed joints and sealed edges at
      intersections with existing surfaces:
      1. STC rating of 35 in accordance with ASTM E90.
      2. Maximum flame spread rating of 75 in accordance with ASTM E84.
   C. Paint surfaces exposed to view from Owner-occupied areas.

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

1.12 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 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. General product requirements.
B. Re-use of existing products.
C. Transportation, handling, storage and protection.
D. Product option requirements.
E. Substitution limitations.
F. Procedures for Owner-supplied products.
G. 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
B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS
A. Shop drawings, product data, and samples under provisions of Section 01 3000.

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, reinstated, 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 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 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.
PRODUCT REQUIREMENTS

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.

3.05 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer’s instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged in manufacturer’s original container with labels intact and legible.
   1. Maintain packaged materials with seals unbroken and labels intact until time of use.
   2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

G. The Architect may reject as non-complying such material and products that do not bear identification and satisfactory to the Architect as to manufacturer, grade, quality, and other pertinent information.

H. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

I. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.06 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

C. Store and protect products in accordance with manufacturers’ instructions. Failure to comply will result in rejection of products for use on job.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

J. Comply with manufacturer's warranty conditions, if any.

K. Do not store products directly on the ground.

L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

N. Prevent contact with material that may cause corrosion, discoloration, or staining.

O. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

P. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

Q. In event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner.

R. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify an extension in the Contract Time of Completion.

END OF SECTION
SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.
B. Requirements for alterations work, including selective demolition, 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 52 - 52: Project record documents, operation and maintenance data, certifications and inspections, warranties and bonds.
F. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

1.03 REFERENCE STANDARDS


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.
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. 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.
   C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
F. 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, Telecommunications, 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 Architect and 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. 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.

E. 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.
   4. Polished surfaces: To surfaces requiring routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished.

F. 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.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>COMPLETE Y/N</th>
<th>DATE COMPLETED</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received Final Payment Request and Release of Claims.</td>
<td></td>
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<tr>
<td>Final Change Order Completed and Signed By All.</td>
<td></td>
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</tr>
<tr>
<td>Contractor’s Affidavit of Payment of Debts and Claims.</td>
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<tr>
<td>Consent of Surety To Final Payment.</td>
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</tr>
<tr>
<td>All Operation &amp; Maintenance Manuals Received.</td>
<td></td>
<td></td>
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<tr>
<td>Final Record Drawings Received.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>All Guarantees and Warranties Received.</td>
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<tr>
<td>Punchlist Fully Cleared (Attached Copy).</td>
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<tr>
<td>Air Quality and Commissioning Completed and All Items Addressed and Corrected.</td>
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<tr>
<td>Written Acknowledgement of Lead and Asbestos Free.</td>
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<tr>
<td>All Attic Stock Delivered to Owner.</td>
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<td></td>
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<tr>
<td>Certificate of Occupancy Obtained From AHJ</td>
<td></td>
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</tr>
</tbody>
</table>

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.
SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Procedures.
B. Project Record Documents.
C. Operation and Maintenance Data.
D. Warranties and bonds.
E. 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 his 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 and document reproduction.

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 shall allow 21 days from date of submission Final Project Record Documents for document reproduction.

j. Contractor will coordinate electronic archiving and document reproduction of the final closeout submittal with Owner's designated company.

k. Contractor will pay all associated cost in preparing close-out documents and pay cost of final closeout submittal digital archiving and document reproduction. Should Owner forgo hard copies, Contractor shall submit a credit to the Owner.

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) original hard copy
      (b) One (1) copy on USB Flash Drive
   2) Closeout Documents – Including Operation and Maintenance Manuals
      (a) One (1) original hard copy
      (b) 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.
   3) Data shall be searchable by key word. All data shall allow printing of material.
   4) Electronic submittal and hard copies shall follow the format shown in Part 3.
   5) Under 3.05,J, 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. Maintain on site one set of the following record documents; record actual revisions to the Work:
   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. Store record documents separate from documents used for construction.
   1. Record Documents may be recorded digitally or hard copy.
   2. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.
   3. In the event of loss of recorded data, use means necessary to again secure the data to the Architect's approval.
      a. Such means shall include, if necessary in the opinion of the Architect, removal and replacement of concealing materials.
      b. In such case, provide replacements to the standards originally required by the Contract Documents.

D. Identify each of the documents with the title, "RECORD DOCUMENTS - JOB SET".

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

F. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

G. Record Drawings and Shop Drawings: Legibly 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, affix or insert all addenda to the record documents, both drawings and specifications. Neatly mark all areas 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, neatly mark the record documents with areas modified by RFIs and change orders.
   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.
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 durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable hard plastic covers; 4 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings by volumes. Staples are not allowed.
D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties organized by division with project scopes listed for each company.
F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
J. Contents: Prepare final project record closeout documents for delivery to Owner 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: 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.
      6) (a) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the SITA
      7) (b) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the CxA
      8) (c) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Code-Required Structural Observer
      9) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Structural Engineer
      10) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Mechanical Engineer
      11) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Electrical Engineer
      12) PDF FILE: Certificates of Occupancy
13) PDF FILE: TEA Certificate of Project Compliance
14) PDF FILE: Final Fire Inspection
15) PDF FILE: Final Health Inspection
16) PDF FILE: Final Elevator Inspection
17) PDF FILE: Final Building Inspection
18) PDF FILE: ADA Inspection Report
19) PDF FILE: Energy Code Compliance Letter
20) PDF FILE: HVAC Test and Balance Reports
21) PDF FILE: Backflow Test Report
22) PDF FILE: Data Testing Results
23) 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
      (organized by Division)
   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.

END OF SECTION
SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Selective demolition of built site elements.
   B. Selective demolition of building elements, furniture and equipment for alterations purposes.
   C. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS
   A. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
   B. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
   C. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 QUALITY ASSURANCE
   A. Demolition Firm Qualifications: Company specializing in the type of work required.
      1. Minimum of 5 years of documented experience.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE
   A. Remove all paving and curbs within construction limits indicated on drawings.
   B. Remove portions of existing concrete slabs as indicated on drawings.
   C. Remove portions of existing walls as indicated on the drawings.
   D. Remove portions of existing ceilings as indicated on the drawings.
   E. Remove fences and gates.
   F. Remove other items indicated, for salvage, relocation, and recycling.
   G. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS
   A. Comply with other requirements specified in Section 01 7000.
   B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
      1. Obtain required permits.
      2. Comply with applicable requirements of NFPA 241.
      3. Use of explosives is not permitted.
4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
5. Provide, erect, and maintain temporary barriers and security devices.
6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
8. Do not close or obstruct roadways or sidewalks without permit.
9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.
D. Prior to submitting proposal, Contractor shall request a list from the Owner stating items which shall be removed by the Owner prior to demolition.
E. Included with the demolition proposal, Contractor shall provide a written declaration of items that will be salvaged from the site. Each item shall be itemized and a monetary value assigned. Credit value of salvaged items shall be included in calculation of proposal. Declaration shall be reviewed by the Owner to determine that the declaration complies with state requirements and local Board policy in regards to disposing of public property.
F. 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.
G. All items noted on the drawings to be removed and delivered to the Owner shall be cataloged with a written description and delivered to Owner at a location designated by the Owner.
H. Do not begin removal until built elements to be salvaged or relocated have been removed.
I. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
J. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.
K. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
L. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
M. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES
A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
B. Protect existing utilities to remain from damage.
C. Do not disrupt public utilities without permit from authority having jurisdiction.
D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
G. Unused underground piping may be abandoned in place, provided it is completely drained and capped; remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS
A. Drawings showing existing construction and utilities are based on existing record documents and field observation.
   1. Verify that construction, salvage items and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.
C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
D. Remove existing work as indicated and as required to accomplish new work.
E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment as indicated on the drawings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
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.
   4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL
A. Remove debris, junk, and trash from site.
B. Remove from site all materials not to be reused on site; do not burn or bury.
C. Leave site in clean condition, ready for subsequent work.
D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION
SECTION 03490 - GLASS FIBER REINFORCED CONCRETE (GFRC)

PART 1 - GENERAL

1.1 RELATED DOCUMENT
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 Section SUMMARY
A. This section includes glass-fiber-reinforced concrete (GFRC) for Concrete Countertops.

1.3 REFERENCE PUBLICATIONS
A. The publications listed below form a part of this specification to the extent referenced.
   1. Precast/Prestressed Concrete Institute MNL-130-09: "Manual for Quality Control for Plants and production of Glass Fiber Reinforced Concrete Products."

1.4 REFERENCES
   A. ASTM C 150 Portland Cement
   B. ASTM C 144 Sand
   C. ASTM C 979 Concrete Pigment
   D. ASTM C 1666 Alkali Resistant (AR) Glass
   E. ASTM C 618-N Fibers Metakaolin

1.5 QUALITY ASSURANCE
A. Manufacturer Qualifications: Manufacturer shall be regularly engaged and experienced in glass fiber reinforced concrete projects of the quality and scope required for this project.
B. Installer Qualifications: Regularly engaged and experienced in the installation of glass fiber reinforced concrete or precast concrete units.
C. Tolerances: Manufacture and install GFRC panels so that tolerances for dimensions and appearance shall be as indicated in MNL-130.
D. Records: Keep quality control records available for two years after final acceptance.

1.6 ACTION SUBMITTALS
A. Shop Drawings: Show fabrication and installation details for GFRC panels including the following:
   1. Panel elevations, sections, and dimensions.
   2. Thickness of facing mix, GFRC backing, and bonding pads for typical panels.
   3. Finishes.
   5. Other items sprayed or cast in GFRC product.
6. Sequence of erection for special conditions.
7. Relationship to adjacent material.
8. Description of all loose, cast-in, and field hardware.

B. Samples

1. Prior to commencement of manufacture, submit samples representative of finished face showing typical range of color and texture.
2. Sample size shall be approximately 12 inches x 12 inches and of appropriate thickness, representative of the proposed finished product.

C. Product Data: For each type of product. Include GFRC design mixes.

1.7 INFORMATION SUBMITTALS

A. Qualification data: For manufacturer.
B. Source Quality-Control Test Reports: For GFRC, inserts, and anchors.

1.8 DELIVERY, STORAGE, AND HANDLING

C. Handle and transport GFRC panels supported on non-staining material and with non-staining resilient spacers between panels.
D. Store GFRC panels off of ground on firm, level, and smooth surfaces supported on non-staining material and with non-staining resilient spacers between panels. Place stored panels so identification marks are clearly visible.

1.9 WARRANTY/GUARANTEE

A. The GFRC contractor shall furnish a written warranty against manufacturing defects in materials or workmanship for a period of one (1) year after substantial completion of project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Source Limitations: Obtain GFRC panels from single source from single manufacturer.
C. Substitutions: Not permitted.

2.2 GFRC MATERIALS

A. Cement: Type I, II, or III White Portland Cement of one type, brand, source and lot throughout project, meeting requirements of ASTM C150.
B. Sand: Washed and dried silica, complying with composition requirements in ASTM C 144; passing a No. 20 (0.85-mm) sieve with a maximum of 2 percent passing a No. 100 (0.15-mm) sieve.
C. Water: Fresh, clean, potable and free of any deleterious matter that would interfere with color, setting or strength of concrete.
D. Glass Fibers: High zirconia content (minimum 16%), alkali resistant glass fibers specifically designed for use in concrete and in compliance with ASTM C1666.

E. Concrete Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.

F. Metakaolin: ASTM C 618, Class N.

G. Polymer Admixture: Acrylic thermoplastic copolymer dispersion complying with PCI MNL 130.

H. Chemical Admixtures: ASTM C 494/C 494M, containing not more than 0.1 percent chloride ions.

2.3 PRODUCT CHARACTERISTICS

A. Typical Mixes

1. Face Mix: Proportion face mix of portland cement, sand, facing aggregates, and admixtures to comply with design requirements.

2. Backing Mix: Proportion backing mix of portland cement, glass fibers, sand, and admixtures to comply with design requirements. Provide nominal glass-fiber content of not less than 4 percent by weight of total mix.

B. Typical Range of GFRC Properties at 28 days:

2. Compressive Strength (Edgewise): Over 5000 psi (34 MPa).
3. Flexural Strength (Yield): 1000 to 1800 psi (6.9 to 12.4 MPa).
4. Flexural Strength (Ultimate): 1200 to 2000 psi (8.3 to 13.8 MPa).
5. Surface Burning Characteristics: Flame spread index of 0, Class A/Class 1 when tested in accordance with ASTM E 84.

2.4 MOLD FABRICATION

A. Construct molds that result in finished GFRC complying with profiles, dimensions, and tolerances indicated, without damaging GFRC during stripping. Construct molds to prevent water leakage and loss of cement paste.


2.5 GFRC FABRICATION

A. Proportioning and Mixing: For backing mix, meter sand/cement slurry and glass fibers to spray head at rates to achieve design mix proportions and glass-fiber content according to PCI MNL 130 procedures.

B. Spray Application: Comply with general procedures as follows:

1. Spray mist coat over molds to a nominal thickness of 1/8 inch (3 mm) on planar surfaces.
2. Proceed with spraying or pouring backing mix before face mix has set, using procedures that produce a uniform thickness and even distribution of glass fibers and matrix.
3. Consolidate backing mix by rolling or other technique to achieve complete encapsulation of glass fibers and compaction.
4. Measure thickness with a pin gage or other acceptable method at least once for every 5 sq. ft. (0.5 sq. m) of panel surface. Take no fewer than six measurements per panel.

C. Hand form and consolidate intricate details, incorporate formers or infill materials, and overspray before material reaches initial set to ensure complete bonding.

D. Curing: Employ initial curing method that ensures sufficient strength for removing units from mold.
E. GFRC Finish: To match approved sample.

F. Manufacturing Tolerances: Manufacture GFRC panels so each finished unit complies with PCI MNL 130 for dimension, position, and tolerances.

G. Cover: Provide embedded anchors, inserts, and other sprayed-in items with sufficient anchorage and embedment for design requirements.

H. Panel identification
   1. Mark each GFRC panel to correspond to identification marks on shop drawings for panel location.
   2. Mark each GFRC panel with date cast.

I. Acceptance: GFRC units which do not meet the color and texture range or the dimensional tolerances may be rejected at the option of the architect if they cannot be satisfactorily corrected.

2.5 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Establish and maintain a quality-control program for manufacturing GFRC panels according to PCI MNL 130.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION/INSPECTION

A. General Contractor's Responsibility
   1. The general contractor shall provide building lines, center and grades in sufficient detail to allow installation of the GFRC units.
   2. The General Contractor shall provide true, level load-bearing surfaces.
   3. Clear, well-drained unloading areas and road access around and in the building (where appropriate) shall be provided and maintained by the general contractor to a degree that hauling and erection equipment for the GFRC units are able to operate under their own power.

B. Installer Responsibility
   1. Verify that all parts of the supporting structure are complete and ready to receive the panels or the GFRC product and that site conditions are conducive to proper installation.
   2. Prior to installation of the units, the installer shall check the jobsite dimensions affecting the work under his contract. Any discrepancies between design dimensions and field dimensions which could adversely affect installation of the GFRC product shall be brought to the attention of the general contractor and architect.
   3. If discrepancies exist, installation shall not proceed until they are corrected or until installation requirements are modified and reviewed by the architect and/or Engineer.

3.2 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.

3.3 INSTALLATION

A. Install GFRC panels level, plumb, square, and in alignment. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.
1. Maintain horizontal and vertical joint alignment and uniform joint width.
2. Remove projecting hoisting devices.

B. Erect GFRC panels to comply with PCI MNL 130 recommendations. REPAIRS

3.4

A. Method: Mix and place patch mixture to match color and texture of surrounding concrete. If patching is not possible or if unacceptable to architect, GFRC unit is to be replaced.

B. Structural Adequacy: Patching will be permitted provided structural adequacy of the unit is not impaired.

C. Damage: Damage caused by other trades that requires replacement or patching shall be performed by the GFRC manufacturer or qualified workmen and paid for by others after written authorization to perform said work.

3.5 CLEANING

A. Perform cleaning procedures, if necessary, according to GFRC manufacturer's written instructions.

3.6 PROTECTION OF WORK

A. The installer or General Contractor shall be responsible for protection of the panels or GFRC product from damage by the other trades working on-site until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion

3.7 INSPECTION AND ACCEPTANCE

A. Acceptance: Final inspection and acceptance of installed GFRC product shall be made by the architect to verify conformance with plans and specifications.

END OF SECTION
SECTION 04 0511
MORTAR AND MASONRY GROUT

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 7200 - Cast Stone Masonry: Installation of mortar.

1.03 REFERENCE STANDARDS

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 conformance 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 C476 and test and evaluation reports to requirements of ASTM C1019.

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 the contract documents.
   1. Maintain one copy of each document on project site.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.07 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.
   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.

   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. Bond Beams and Lintels: 2,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
      a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
      b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.02 MATERIALS

A. 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.

B. Portland Cement: ASTM C150/C150M.
   1. Type: Type I - Normal; ASTM C150/C150M.
   2. Color: Color as required to produce approved color sample.

C. Masonry Cement: ASTM C91/C91M.
   1. Type: Type N; ASTM C91/C91M.

D. Hydrated Lime: ASTM C207, Type S.

E. Quicklime: ASTM C5, non-hydraulic type.

F. Mortar Aggregate: ASTM C144.


H. 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
      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
      d. Substitutions: See Section 01 6000 - Product Requirements.

I. Water: Clean and free from deleterious acids, alkalies, and organic matter.

J. Integral Water Repellent Admixture: Polymeric liquid or powder admixture added to mortar and grout at the time of manufacture.
   1. Performance of Mortar and Grout with Integral Water Repellent:
      a. Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours:
         1) No water visible on back of wall above flashing at the end of 24 hours.
         2) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
         3) No more than 25% of wall area above flashing visibly damp at end of test.
      b. Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
      c. Compressive Strength: ASTM C1314; maximum 5 percent decrease.
      d. Drying Shrinkage: ASTM C1148; maximum 5 percent increase in shrinkage.
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.
   1. Portland Cement or Blended Cement: Types I, IA, II, IIA, III or IIIA.
   2. Portland Cement or Blended Cement: Types IS, IS-A, IP, IP-A, I(PM), I(PM)-A, I(SM), OR I(SM)-A.
   3. Portland Cement or Blended Cement: Types GU, HE, MS, HS, MH, or LH.
   4. Lime: Hydrated lime, Type S.
   5. Sand: Mason's sand
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.

2.05 PRECONSTRUCTION TESTING
A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 4000 - Quality Requirements.
B. 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.

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.
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 GROUTING

A. Factory blended hydraulic cement based product containing aggregate and Portland cement, blended cement, proportioned to produce grout complying with ASTM C476 for the specified type of grout; Coarse Core Fill Grout and Fine Core Fill Grout.

<table>
<thead>
<tr>
<th>Grout Pour Height (ft)</th>
<th>1'-0&quot;</th>
<th>5'-0&quot;</th>
<th>12'-0&quot;</th>
<th>24'-0&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum width of grout space between wythes (in)</td>
<td>Grout Type - Fine</td>
<td>3/4&quot;</td>
<td>2&quot;</td>
<td>2-1/2&quot;</td>
</tr>
<tr>
<td></td>
<td>Grout Type - Coarse</td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td>2-1/2&quot;</td>
</tr>
</tbody>
</table>

1. Portland Cement or Blended Cement: ASTM C 150 Types I, IA, II, IIA, III or IIIA.
2. Portland Cement or Blended Cement: ASTM C 595 Types IS, IS(MS), IS-A, IS-A(MS), IP, or IP-A.
3. Portland Cement or Blended Cement: ASTM C 1157 Types GU, HE, MS, or HS.
5. Coarse Grout: Adjust aggregate proportions to provide evenly graded mix which will be easily pumped, with coarse aggregate content no greater than maximum specified in the proportion specifications of ASTM C 476.

B. Water: Clean and free from deleterious acids, alkalies, and organic matter.

C. No Admixtures are allowed except water repellents where required.
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 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 - Mortar and Masonry Grout.
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: Weather protection for masonry surfaces.
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
E. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.
H. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.
K. NCMA TEK 19-7 - Characteristics of Concrete Masonry Units with Integral Water Repellent, 2008

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. Samples: Submit four samples of Architectural Masonry Units to illustrate color, texture, and extremes of color range.
D. 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 the 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:
   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 Units: ASTM C90, lightweight.
   6. 4" wide units shall be provided as hollow cell units.

2.02 BRICK UNITS

A. Manufacturers:
   1. Acme Brick Company: www.brick.com
6. Interstate Brick:  www.interstatebrick.com
7. Sioux City Brick:  www.siouxcitybrick.com
8. Summit Brick:  www.summitbrick.com
10. 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.
   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:
      2. WIRE-BOND:  www.wirebond.com/#sle.
      3. 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 B. Mill-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. Adjustable Wall Ties (Pintles & Eyes) 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.

H. Masonry Veneer Anchors with Stud Backup Systems (including exterior walls and any interior stud walls with masonry veneer): Install a two piece anchored adjustable wire tie system at 16" on center each way, using DW-10 Wall Ties as manufactured by Hohmann & Barnard, Inc. or equal with screws as recommended by the manufacturer and as required by the applicable version of TMS 402.
   1. Reference Section 07 2113 for veneer ties specified as part of the Insulated Sheathing Systems.

2.05 FLASHINGS

A. Metal Flashing Materials: All types, 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. Precast Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      b. WIRE-BOND: www.wirebond.com/#sle.
   2. Joint Filler: Closed cell polyethylene; oversized 50 percent to joint width; self expanding; 1/2 inch wide by maximum lengths available.
      1. Manufacturers:
         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:
            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. 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 D2L bars 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.

3.05 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 comers, 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.

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
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 25°F 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, fabricated metal frames, window frames, wood nailing strips, anchor bolts, and plates and other items to be built into the work and furnished under other sections.
B. Install built-in items plumb, level, and true to line.
C. Bed anchors of metal door 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
PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section incorporates general carpentry standards for the project including all rough carpentry work including but not be limited to the following:
   1. Structural and non-structural framing.
   2. Build-up structural beams, laminated wood beams, laminated veneer beams, posts.
   3. Wall, floor and roof sheathing.
   4. Miscellaneous blocking and fur downs.
   5. Rough hardware including nails, metal joist hangers, spikes, bolt, nuts, screws and washers including anchor bolts for installing post bases as posts are installed.
   6. Arbor and decks.
   7. Siding, Soffits and exterior trim.
   8. Sealant at pressure treated sill plates.
  10. Sill sealer.

1.02 RELATED WORK

A. Refer to Structural Engineer's Contract Documents for specific requirements to be utilized for the project.
B. Section 076200- Wall Flashings

1.03 GENERAL REQUIREMENTS

A. The Contractor shall furnish an affidavit from the manufacturer certifying that the materials or products delivered to the project meet the requirements specified along with the initial lumber payment request.
B. All lumber and wood structural panels shall be clearly identified by grade mark of a recognized grading association. All timber materials shall be stored 3" clear from ground or pavement surfaces.
C. Fire-retardant lumber within the building where utilized must also be labeled with: identifying mark of an approved manufacturer; name of fire-retardant treatment; wood species treated; flame spread and smoke developed index; drying method used for treatment; conformance to appropriate standards; design value adjustments.
D. Allowable tolerances, unless indicated otherwise:
   1. Variation from plumb: + 3/8" in 10'0", non-cumulative.
   2. Variation in horizontal squaring diagonals: 1/2".
   3. Variation in location of walls from dimension: + 1/4".
   4. Location of dimensioned openings: + 3/8".
5. Variation in rough opening size: + 1/4", - 1/8". 1.04

SUBMITTALS

A. Product Data: Submit manufacturer current technical literature for each component.

B. Quality Assurance Submittals - Building Wrap
   1. Design Data, Test Reports: Provide manufacturer test reports indicated product compliance with indicated requirements.
   2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
   3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

C. Closeout Submittals
   1. Building Wrap Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.05 QUALITY ASSURANCE

A. Mock-up
   1. Install mock-up of exterior wall assembly which includes building wrap, exterior finishes as per Architect's design prior to ordering materials.
      a. Mock-up size: 10' x 10'
      b. Mock-up may remain as part of the work.
   2. Contact manufacturer's designated representatives prior to assembly installation, to perform required mock-up visual inspection and analysis as required for warranty, including building wrap installation. Mock-up tested per Section 014300, per E1105 test.

B. Pre-installation Meeting
   1. Hold a pre-installation framing conference, four weeks prior to start of installation. Attendees shall include Contractor, Architect, Engineer, Consultant, Installer, Owner's Representative, and product manufacturer's Designated Representative.
   2. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of building wrap assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.06 WARRANTY

A. Building Wrap
   1. Special building wrap manufacturer's warranty for weather barrier assembly for a period of ten (10) years from date of final weather barrier installation to be supplied.
   2. Approval by weather barrier manufacturer for warranty is required prior to assembly installation.
PART 2 - PRODUCTS
2.01 MATERIALS

A. Treated lumber and wood structural panels:
   1. Materials used on the exterior of the structure such as sill plates, sheathing and other direct
      contact materials to concrete or exposed to weather shall be treated material and shall
      have a moisture resistant preservative treatment that is arsenic and chromium free
      produced in accordance with ACQ Preserve Standard ACQ-94 and appropriate AWPA
      Standards (C1, C2, C22, C4, C5, C15, C17, P5) Chemical Specialties Inc. Treated
      Preserve, complying with HUD UM 48.
   2. Material utilized, wall sheathing and initial 4' wide floor decking/sheathing at all exterior
      walls are required to be fire-rated and shall be fire-retardant treated per AWPA C17 and to
      meet Section 2303.2 of the IBC with no significant progressive combustion when ASTM
      E84 is continued for an additional 20 minutes. Material used for exterior use must also meet
      ASTM D2898.

B. Framing Lumber: Grades and types of lumber required shall be as indicated on the Drawings
   and if not specifically shown, shall be in accordance with A.F.P.A. framing and racking
   requirements and applicable codes and regulations and these specifications. Moisture content
   as follows: Treated and untreated lumber less than 2" in thickness
   - 19% maximum, untreated lumber over 2" in thickness - 19% maximum. Lumber sizes shall
   conform to American Softwood Lumber standard PS20-70 and unless otherwise noted shall be
   S4S.
   1. Framing lumber, 2" to 4" thickness.
      a. General framing: As noted on structural plans.
      b. General utility purposes: Utility grade or Hem-Fir or SPF.
      c. Lumber in contact with concrete/masonry: Preservative treated in accord with
         specified standards.
   2. Studs:
      a. Loadbearing: As noted on structural plans.
      b. Non-load bearing: Stud grade Hem Fir, Douglas Fir Larch, Southern Pine, or Spruce
         Pine Fir (finger joint desired), meeting ALSC current grading standards.
      c. Fire-rated studs precision end cut after treatment to match standard stud lengths.
   3. Structural joists and planks, 2" to 4" thickness, 5" and wider, floor joists, ceiling joists, and
      rafters: Conform to spans as set forth in "Span Tables for Joists and Rafters", current
      edition, as published by American Forest and Paper Association; sizes as indicated on
      drawings: No. 2 grade minimum.

C. Glue laminate members: Refer to structural drawings.

D. Microlam members: bending stress of 2,900 psi; bearing stress of 550 psi; shear stress of 290
   psi; compression stress (parallel to grain) of 2,900 psi and "E" of 2,000,000 psi.
E. Structural panel sheathing: 15/32" thick APA Rated Sheathing, Exposure I plywood or OSB material, 24/16 span rating; 1/2" thick exterior DenseGlas sheathing. Provide solid wood sheathing and blocking if required by manufacturer behind any specialty metal siding surfacing.

F. Wall sheathing at breezeways: 5/8" thick Fire Code Mold Resistant Sheathing, Temple Structgard, ASTM C1396 unless 7/16" thick APA plywood or OSB sheathing required by structural plans. Draftstop either 5/8" gypsum board or 1/2" thick Homasote sheathing.


H. Exterior Soffits noted as wood: 1/4" thick cementitious smooth panel material in as large a piece as possible, with continuous non-corrosive insect mesh for ventilation or by use of Tamlyn Vent Screens of proper size. Provide 3/8" x 1" screen mold battens or vinyl H moldings and/or continuous screen mesh at any other ventilated area. Provide manufacturer's transferable 25 year warranty on material.

I. Miscellaneous Specialties: Joist hangers, 16 gauge steel as required by code for loading conditions with proper fasteners. All miscellaneous materials, nails, bolts, screws, joist hangers, plates, clips, etc., shall be the best quality of their respective kind and shall be sized properly for the intended use and loading. Metal items exposed to the exterior, galvanized or other corrosion resistant type. Provide acceptable fastener finish for all preservative-treated materials. All miscellaneous materials shall be installed in strict compliance with manufacturer's specifications and recommendations. Exterior wood posts bearing on concrete to be provided with galvanized post base supports.

J. Insulation baffle: Plastic, 48 inch long x 22 inch wide ventilation channel with a free area of 18.7 square inches.

K. Wood arbor/trellis material: #2 Appearance grade, cedar or redwood, S4S for framing members.

L. Hurricane straps: 1/8" x 1-1/2" hot dip galvanized steel of sufficient length to wrap around both steel reinforcing and both faces of truss or rafter, with holes on each face of truss or rafter permitting 3 spikes each face, per structural drawings.

M. Heavy timber: Grade designation as noted on structural plans, S4S in sizes indicated, preservative treated.
O. Balcony/patio edging: Schulter BARA-RWL preformed aluminum; drainable balcony and deck stop ED with integral holes at 2" o.c.

P. Building wrap over wall sheathing: High density polyurethane ultra-fine fibers formed by spun fibers and heat to produce a UV stabilized building wrap. Material to have a water vapor transmission rating of 28 perms per ASTM E96 Method B; air penetration of 0.001 cfm at 25 mph; water penetration resistance minimum 280 cm AATCC-127-210. Manufacturer Tyvek Commercial Wrap. Provide seam tape, proper disc fasteners (no staples) and flashing as a complete system.

Q. Parapet wall sheathing: 7/16" thick structural fiber reinforced cement board, Plycem as made by U.S. Architectural Products or equal. Provide aluminum mesh screening at parapets if noted for ventilation, minimum 12.7 sq. inch net open area per foot, insect proof.

R. Sill Sealer: Protecto Wrap Triple Guard moisture sill barrier.

S. Siding: Fiber cement 1/4" thick cementitious wood grain finish lap siding, 8" nominal as made by Nichihai or approved equal in sizes noted. Material to have a Class A flame spread rating. Material sizes as shown on plans varies. Provide manufacturer's standard 25 year Transferable Product Warranty against manufacturing defects, cracking, rot or delaminating and termite resistance. Panel materials to be provided with reveal trim and molding systems by siding manufacturer.

T. Hurricane window clips: Plylox metal clip system designed for use with 3/4" CDX grade or better plywood, provide quantity of clips required for storefront window pane sizes.

PART 3 - EXECUTION

3.01 GENERAL

A. Framing Practices: Framing dimensions, details and layouts shall be as indicated on the Drawings and shall be in accordance with applicable codes and ordinances and shall comply with National Lumber Manufacturer's Association "Manual for House Framing" minimum standard.

B. Install all wood nailers, blocking, furring, etc., making proper provision for work of other trades. Do all cutting of wood required to accommodate plumbing, heating and ventilating, electrical and other trades. Provide sufficient clearance at all plumbing pipe penetrations around all exposed items, such as outlet boxes, conduit, pipes, ducts and especially at horizontal to vertical stacks to allow for minimum 3/8" clearance for potential shrinkage/movement.

C. Buildings to be pre-loaded with drywall and concrete underlayment prior to installation of veneer systems.

3.02 FRAMING

A. Framing, sizes, spacing, connections, etc., shall be as indicated on the Drawings; shall be in accordance with applicable codes and ordinances; and recommendations specified.
in Wood Construction Manuals as prepared by National Lumber Manufacturer's Association.

B. Plates, stud members and headers:
   1. Provide single bottom plate and double top plates for partitions; top plate splices to occur over studs.
   2. Provide studs in continuous lengths without splices.
   3. End nail studs to lower top plate and bottom plate.
   4. Overlap double top plate full width at corners and intersections. Splices as required in double plate members shall be off-set 3'-0" minimum. Face nail upper top plate to lower top plate.
   5. Provide three (3) stringers for all wood stairs; treads glued and screwed to stringers.
   6. Secure bottom plate to structure with anchor bolts, metal embed anchors or other approved methods, spacing not to exceed code allowable spacings. Sill plate provided with sealant bead at exterior face between sill and concrete.
   7. Double studs at corners and partition intersections, minimum of double studs beneath all beam bearing conditions, unless noted differently on structural drawings.
   8. Locate extra joist or truss directly below stud walls for partition running parallel with joists or truss when wall length exceeds 40 percent of joist or truss length.
   9. Frame openings for load bearing partitions as follows (unless engineered components are used:
      a. Openings less than or equal to 6'-0": Single stud, single jack stud each side of opening and headers.
      b. Openings over 6'-0": Single stud, double jack stud each side of opening and headers.
   10. Frame openings for non-load bearing partitions with single stud, single jack stud each side of opening and headers.
   11. Refer to plans for wall sheathing bracing requirements.

C. Joists/Rafters
   1. Install with crown edge up. Support ends of each member minimum 1-1/2" of bearing on wood or steel, 3" on concrete. Lap members framing from opposite sides of beams, girders or partitions minimum 4" or tie opposing members by toenailing or metal connectors.
   2. Cut rafters to set on exterior wall plates. Shim and toenail to plate. Provide truss anchors for roof trusses connected to top plates. Place rafters directly opposite each other at ridge and nail to ridge member. Provide bridging at third points.

D. Bridging and blocking:
   1. Install bridging as required with ends of bridging secured in place after subflooring or roof sheathing has been laid and partition framing has been installed.
   2. Install wood blocking as necessary for application of siding, soffits, trim, grab bars, towel rods, all strike and deadbolt lock plates at entry doors, etc., and as required for fire stopping. Blocking accurately cut and fit between members, solid (filled) tight to framing, securely anchored thereto.
3.03 WOOD STRUCTURAL PANEL SHEATHING

A. Install panels with face grain perpendicular to supports in accordance with standards of the APA - The Engineered Wood Association. End joints shall occur over supports with end joints staggered. Provide 1/8" gap at side and end joints with nailing 3/8" from edges. Edges not over framing member shall be supported by edge clips or blocking at roof sheathing. Materials secured with 8d common nails spaced per APA requirements or as indicated on structural drawings, staples not permitted. Floor sheathing glued and nailed, installer to inspect for levelness, shim and adjust as required - full contact required to framing. Install underlayment and sheathing to meet requirements of TCA Handbook Detail F142 for a suspended floor substrate beneath ceramic tile flooring.

3.04 WALL SHEATHING

A. Prior to installation of sheathing, inspect framing for any conditions which may interfere with installation. Provide 1/8" gaps at all side and end joints. Provide blocking where required so that all vertical joints are centered over framing members. Sheathing installed with galvanized nail fasteners spaced at 8" o.c. throughout panel with fasteners at 4" o.c. at edge conditions, unless structural drawings indicate otherwise. Staples not permitted. Install panels tight over gaps or openings present and sheathing extending over sill plates. Where band-joist lumber shrinkage is anticipated, secure sheathing only to top plate of band joist area. Provide necessary shims as may be required for proper installation of doors and windows. Refer to structural plans for additional requirements. Plywood sheathing utilized at all areas requiring metal siding type finish materials.

3.05 WOOD TRIM

A. Install exterior trim materials in longest lengths practicable. Provide one piece for locations requiring pieces less than 12'0"; for locations requiring pieces longer than 12'0", multiple pieces may be used providing no single piece is less than 4'0" long. Miter trim splices to shed water for vertical trim; plain miter for fascia splices. Terminate fascia board ends on solid backing. Use 8d non-staining box, casing, or siding nails at 16" o.c. doubled at doors and windows; 2'0" o.c. doubled at vertical trim and fascias.

3.06 BUILDING WRAP

A. Provide 1 layer of building wrap to all wall sheathing areas, install per manufacturer's instructions, weather lapping edges and ends minimum 6 inches, extend around corner minimum 12 inches; provided with building wrap system utilizing disc fasteners (no staples) and recommended tape and sealant. Seam all lapped edges, seal all tears, flash all openings. Contractor shall notify building wrap representative to provide periodic observations of building wrap assembly installation, final letter of conformance required.
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 wall finish.
   B. Board insulation at masonry exterior wall behind MCM or Metal Wall Panel wall finish.
   C. Batt 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
   F. BIA - The Brick Industry Association; Tech Note on Brick Construction, 28B Revised II.

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:
1.05 FIELD CONDITIONS
A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS
2.01 APPLICATIONS
A. Insulation Inside Masonry Cavity Walls: Polyisocyanurate (ISO) board.
B. Insulation Over Metal Stud Framed Walls, Continuous: Polyisocyanurate (ISO) board.
C. Insulation Over Metal Stud Framed Walls, Continuous with MCM or Metal Wall Panels: Polyisocyanurate (ISO) board.
D. Insulation in Metal Stud Framed Walls: Batt insulation with no vapor retarder.
E. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS
A. Polyisocyanurate (ISO) Board Insulation with Facers Both Sides (Installed on masonry wall, behind MCM or metal wall panels): Rigid cellular foam, complying with ASTM C1289; Type I, aluminum foil both faces; Class 1 or 2.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   4. Compressive Strength: 16 psi at horizontal locations.
   5. Compressive Strength: 25 psi at vertical locations.
   6. Board Size: 48 by 96 inch, cut to fit locations indicated.
   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:
      e. GAF: www.gaf.com/sle.
      i. Substitutions: See Section 01 6000 - Product Requirements.

2.03 FIBER BOARD INSULATION MATERIALS
A. Glass Fiber Board Insulation: Rigid glass fiber, ASTM C612.
   1. Provide in 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.
8. Manufacturers:
   d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 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.
   7. Facing: Aluminum foil, flame spread 25 rated; one side.
   8. Manufacturers:
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Mineral Fiber Batt Insulation: 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. Where indicated or required, provide as part of a tested and approved assembly in accordance with NFPA 285.
   2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   3. Manufacturers:
      b. ROCKWOOL (ROXUL, Inc); AFB evo™: www.rockwool.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Acoustical Batt Insulation:
   1. 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. Thermal Resistance: R-value of 3.20 per inch of thickness.
      d. Thickness: 3.50 inch.
      e. Facing: Unfaced.
   3. Manufacturers:
      b. Guardian Fiberglass Insulation; Acoustical Sound Batts: www.guardianfiberglass.com
      e. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

A. Air Barrier Sheet or Air Barrier Coating: See Section 07 2500.

B. Faced Insulation Tape: Bright aluminum, or as recommended by insulation manufacturer, self-adhering type, 2 inch wide, minimum.
C. Tape joints of rigid insulation in accordance with insulation manufacturers' instructions, self-adhering type, 4 to 6 inches wide, as part of a tested and approved assembly where required to be in accordance with NFPA 285.

D. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

E. Wire Mesh: Galvanized steel, hexagonal wire mesh.

F. 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.

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install ISO boards 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.

B. Install boards horizontally on walls.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

D. Tape insulation board joints.

3.03 BOARD INSTALLATION AT CAVITY WALLS

A. Install boards to fit snugly between wall ties.

B. Install boards horizontally on walls.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 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. Ceiling 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. Exterior Thermal Insulation Panels: Apply vertically. Close all joints tightly. Cover all areas of the wall requiring insulation. Secure insulation with 3" self-drilling, self-tapping steel screws with 1" diameter steel or plastic washers spaced 12" on center.

H. Coordinate work of this section with construction of weather barrier specified in Section 07 2500.
3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION
SECTION 07 4110
STANDING SEAM METAL ROOF PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Factory-formed metal roofing or soffits, including flashing and accessories

1.2 RELATED SECTIONS

A. Section 06 1000 - Rough Carpentry
B. Section 07 6200 - Sheet Metal Flashing

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)


2. ASTM A653: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanized) by the Hot-Dip Process

3. ASTM E283/1680 - Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors under Specified Pressure Differences across the Specimen

4. ASTM E331/1646 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Status Air Pressure Difference


B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)

1. SMACNA Architectural Sheet Metal Manual

C. Underwriters Laboratories (UL Classified Tests)

1. UL 263 - Fire Tests of Building Construction and Materials
2. UL 580 - Test for Wind-Uplift Resistance of Roof Assemblies
3. UL 790 - Test for Fire Resistance of Roof Covering Materials
4. UL 2218 - Impact Resistance Test

1.4 SYSTEM DESCRIPTION

A. Performance Requirements: Provide sheet metal roofing that has been manufactured, fabricated and installed to withstand structural and thermal movement, wind loading and weather exposure to maintain manufacturer’s performance criteria without defects, damage, and failure of infiltration of water.

1. Wind-Uplift: Roof panel assembly shall test in accordance with ASTM E 1592 for substrates indicated to meet required 110 mph wind exposure and ASCE 7 wind uplift pressures including perimeter and corner enhancements:
   a. Field = -90 psf
   b. UL Classification 580 for UL Classified 90 rated assemblies

2. Static Air Infiltration: Completed roof system shall have a maximum of .06 cfm/sf with 6.24 kPa air pressure differential as per ASTM E283/1680

3. Water Infiltration: No evidence of water penetration at an inward static air pressure differential of not less than 6.24 psf (43 kPa) and not more than 12.0 psf (83 kPa) as per ASTM E331/1646

1.5 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

1. Product Data: Submit product data, including manufacturer’s SPEC-DATA product sheet, for specified products.

B. Shop Drawings

1. Submit complete shop drawings and erection details, approved by the metal roofing manufacturer, to the DP for review. Do not proceed with manufacturer of roofing materials prior to review of shop drawings and field verification of all dimensions. Do not use drawings prepared by the DP for shop or erection drawings.

2. Shop drawings show roof plans, elevations, methods of erection, and flashing details.
C. Performance Tests
   1. Submit certified test results by a recognized testing laboratory in accordance with
specification test methods for each panel system.

Cl. Samples: Submit selection and verification samples for finishes, colors and textures.

CII. Quality Assurance Submittals to be submitted:
   1. Certificates: Product certificates signed by manufacturer certifying materials
      comply with specified performance characteristics and physical requirements.
   2. Manufacturer’s Instructions: Manufacturer’s installation instructions.

CIII. Closeout Submittals (submit the following)
   1. Operation and Maintenance Data: Operation and maintenance date for installed
      products in accordance with Division 1 Closeout Submittals, Maintenance Data
      and Operation Data Section. Include methods for maintaining installed products
      and precautions against cleaning materials and methods detrimental to finishes
      and performance.
   2. Project Warranty: Warranty documents specified herein are:
      a. Manufacturer’s warranty: Submit to Design Professional for review and
         acceptance, manufacturer’s standard warranty document executed by
         authorized company
         
         official. Manufacturer’s warranty is in addition to and not limited of, other
         rights the Owner may have under the contract documents.
      b. Warranty Period: 20 years commencing on Date of Substantial Completion.
   3. Record Documents: Project record documents for installed materials in
      accordance with Division 1 Closeout Submittals, Project Record
      Documents Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing Work of this section who has
   specialized in the installation of Work similar to that required for this project.
   1. Certificate: Submit certificate indicating qualifications and Manufacturer approval
      to obtain the specified warranty.

B. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors
C. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, Manufacturer’s installation instructions and Owner’s warranty requirements.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site in Manufacturer’s original crating, properly labeled for identification and installation purposes. Store materials in accordance with panel manufacturer’s recommendations. Handle materials carefully to avoid damage to panels and finishes.

   1. Ordering: Comply with Manufacturer’s ordering instructions and lead-time requirements to avoid construction delays.

B. Identify fabricated components with UL 90 Classified label where appropriate.

C. Storage and Protection: Store materials protected from exposure to harmful conditions. Material must be stored in a dry, above ground location.

   1. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture to run off.

   2. Prevent contact with material that may cause corrosion, discoloration or staining.

   3. Do not expose to direct sunlight or extreme heat trim material with factory applied strippable film.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.9 WARRANTY

A. Project Warranty: Warranty shall conform to the General Conditions of the contract.

B. Manufacturer’s Warranty: Submit, for Owner’s acceptance, Manufacturer’s non-prorated, NDL warranty against leaks or defects in the metal roof system materials and workmanship. Warranty coverage shall include deterioration of the panel finish against color fade, chalking and film integrity.

   1. Warranty Period: Twenty (20) years commencing on Date of Substantial Completion.
PART 2 PRODUCTS

2.1 SHEET METAL

ROOFING
A. Manufacturer
   1. Petersen Aluminum Corporation, 1005 Tonne Road, Elk Grove Village, IL 60007
   2. Architectural Building Components, 11625 N. Houston Rosslyn, Houston, TX 77086
   3. DP Approved Equal in accordance with Sections 01 30 00 and 01 60 00

B. Panel Type
   1. PAC-CLAD SNAP-CLAD panels and trim
      a. Seam Height: 1 ¾" (44 mm) minimum seam height.
      b. Material: 22 gauge G-90 Hot-dipped Galvanized Steel
      c. Panel Dimension: 18 in (457mm) o.c.
      d. Factory applied in-seam sealant
   2. PAC-CLAD TITE-LOC PLUS panels and trim (for curved radius panel areas)
      a. Seam Height: 1 ¾" (44 mm) minimum seam height.
      b. Material: 22 gauge G-90 Hot-dipped Galvanized Steel
      c. Panel Dimension: 18 in (457mm) o.c.
      d. Factory applied in-seam sealant
   3. Factory produced Eave Notching for trimmed eave panels
   4. Texture: Smooth
   5. Rating: Wind resistance for the roof assembly including substrate and insulation components as required to meet IBC 2015 and most current version of ASCE 7 wind design uplift pressures.
   6. Flashing and Trim: 22 gauge G-90 Steel
   7. Fasteners
a. SNAP-CLAD galvanized steel, non-penetrating high performance clips for roofing application and UL Classified 90 rated (wind uplift) assemblies and standard clips for mansard and fascia applications.

b. TITE-LOC PLUS galvanized steel, non-penetrating high performance clips for roofing application and UL Classified 90 rated (wind uplift) assemblies and standard clips for mansard and fascia applications.

8. Sealant Bead: Factory applied sealant bead.

C. Weathertight warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace standing seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 Years from date of Substantial Completion

Cl. Finish warranty: Manufacturer’s standard form in which manufacturer agrees to repair finish or replace standing seam metal roof panels that show evidence of deterioration of factory-applied finish within specified warranty period.

1. Exposed Panels Finish - deterioration includes the following:
   a. Color fading more than 5 hunter units when tested according to ASTM D 2244
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214
   c. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.

2. Warranty Period: 20 Years from the date of substantial completion

CII. Applicator shall furnish written warranty for a two (2) year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight condition.

CIII. Panel Finish

1. Finish color selected from Manufacturer’s standard colors through Design Professional.

2. Panel Underside: Polyester wash coat with dry film thickness of 0.3 mils.

CIV. Flashing and Trim: Manufacturer’s standard flashing and trim profiles, factory formed, gauge as recommended by DP, color and finish to match metal roofing panels.

2.1 RELATED MATERIALS

Strohmeyer Architects Inc

Amy Parks Heath Elementary Outdoor Learning Center
Heath, Texas
A. General: Coordinate use of related materials:

B. Roofing Underlayment

1. On all surfaces to be covered with roofing material, furnish and install a 40 mil "Peel & Stick membrane", required as outlined by metal panel manufacturer. Membrane to be a minimum of 40 mil thickness, smooth, non-granular, by one of the following manufacturers:
   a. W.R Grace "Ice & water Shield"
   b. Cetco Strongseal
   c. Carlisle CCW WIP 300HT
   d. Interwrap Titanium PSU
   e. MFM Corp "Wind & Water Shield"
   f. Polyguard Deck Guard HT of Polyglas HT
   g. Tamko TW Tile and Metal Underlayment

2. Underlayment shall be laid in horizontal layers with joints lapped toward the eaves a minimum of 6", and well secured along laps and at ends as necessary to properly hold the felt in place. All underlayment shall be preserved unbroken and whole.

3. Ice and Water Shield shall lap all hips and ridges at least 12" to form double thickness and shall be lapped 6" over the metal of any valley or built-in gutters and shall be installed as required by the Standing Seam Panel Manufacturer to attain the desired 20 Year Weathertightness Warranty.

C. Sealants

1. Provide two-part polysulfide class B non-sag type for vertical and horizontal joints, or

2. One part polysulfide not containing pitch or phenolic extenders, or

3. Exterior grade silicone sealant recommended by roofing manufacturer, or

4. One part non-sag, gun grade exterior type polyurethane recommended by the roofing manufacturer.

D. Nailable Insulation: Closed cell polyisocyanurate insulation with factory laminated 7/16" thick APA rated Oriented Strand Board (OSB) top surface.

1. Atlas Nailbase Insulation; or DP approved equal in accordance with Sections 01
30 00 and 01 60 00

a. Minimum Thickness: 2.5"
b. Compressive Strength: 25 psi
c. Thermal Resistance (LTTR value) of: LTTR - 12.0

E. Polyisocyanurate Insulation: Rigid polyisocyanurate board, with a strong white or black fibrous glass facer conforming to or exceeding the requirements of ASTM C 1289 / FS HH-l-1972. **EnergyGuard™ Polyiso Insulation** or approved equal, with the following characteristics:

1. Board Thickness: 2.0"
2. Thermal Resistance (LTTR value) of: R 11.4
3. Compressive Strength: 25 psi

F. Bituminous Coating: Cold-applied asphaltic mastic. Provide compound free of asbestos fibers, sulfur components and other harmful impurities.

G. Pipe Flashing: EPDM rubber boot with aluminum compression band.

2.2 FABRICATION

A. General

1. Continuous Length: Fabricate panels 55’ (16.2 m) and less in one continuous length.
2. Trim and Flashings: Fabricate trim and flashings from same material as roof system.
3. Portable Roll Former: Panels fabricated by portable roll former shall not be approved.

2.3 FINISHES

A. Factory Applied Finish

1. Topside: Full-strength fluoropolymer (70% Kynar® 500 or Hylar® resin) system of 1.0 mil total dry film thickness.
2. Underside: Wash coat of 0.3 - 0.4 mil dry film thickness.
3. Texture: Smooth texture, dull matte specular gloss 25 - 35% at 60°.

2.4 WARRANTIES

A. Weathertight warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 Years from date of Substantial Completion

B. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace standing seam metal roof panels that show evidence of deterioration of factory-applied finish within specified warranty period.

1. Exposed Panels Finish - deterioration includes the following:
   a. Color fading more than 5 hunter units when tested according to ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
   c. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.

2. Warranty Period: 20 Years from the date of substantial completion
   a. Applicator shall furnish written warranty for a two (2) year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight condition.

PART 3 EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

A. Compliance: Comply with Manufacturer’s product data, recommendations and installations instructions for substrate verification, preparation requirements and installation.

1. Strippable Film: Remove Manufacturer’s protective film, if any, from surfaces of roofing panels.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for project installation in accordance with Owner’s instructions.

3.3 PREPARATION

A. Coordination: Coordinate metal roofing with other Work (drainage, flashing and trim, deck
substrates, parapets, copings, walls) and other adjoining Work to provide a non-
corrosive and leak-proof installation.

B. Dissimilar Metals: Prevent galvanic action of dissimilar metals.

C. Tear Off and Deck Repair:

1. The existing roofing and flashing materials shall be completely removed down to
deck. The deck shall be inspected, cleaned, repaired, and otherwise conditioned
to conform to the requirements of a new metal deck.

2. Deteriorated existing metal decking shall be removed and replaced to match
existing.

3. All old flashing must be removed and stripped from all walls, curbs, etc.

4. All existing composition and metal flashing must be removed and replaced.

5. All metal counterflushing, metal coping, and other metal work above the roof
system must be inspected, and replaced or repaired as shown on drawings to
provide a watertight assembly.

6. All rooftop equipment shall be carefully removed as required and reinstalled per
project drawings after completion of the Work. Rooftop equipment scheduled for
demolition shall be properly disposed of and new installed. Nailers and curbs
shall be removed and replaced with new treated lumber if necessary. Openings
shall be covered temporarily with plywood and roof membrane while equipment is
stored elsewhere. Air intake and exhaust openings shall not be sealed but shall
be hooded to permit flow of air.

7. All Work shall be coordinated so that all materials removed each day shall be
replaced and made watertight the same day.

D. Nail Base Roof Insulation: Install one layer of polyisocyanurate nail base roof insulation
over base layer of polyisocyanurate insulation in accordance with manufacturer
requirements. Install Nail Base Roof Insulation in accordance with manufacturer
guidelines. Mechanically attached to meet FM 1-90 with perimeter and corner
enhancements. Total combined R-value to equal R25.

E. Moisture Barrier Underlayment: Install self adhered moisture barrier underlayment directly
over the installed nail base roof insulation. Insulation OSB top surface must be clean, dry
and smooth. Remove all dust, dirt, debris and protrusions from the surface prior to
installation of underlayment.
1. Apply underlayment only in fair weather when the air, roof deck and membrane are at temperatures of 50 degrees F or higher.

2. Install membrane in accordance with Manufacturer’s specifications. Cut the membrane into 10’ - 15’ lengths and reroll loosely. Peel back 1’ - 2’ of release liner, align the membrane, and continue to peel the release liner from the membrane. Press the membrane in place with heavy hand pressure. Side laps must be a minimum of 3 1/2" and end laps must be a minimum of 6" or as required by the Manufacturer.

3. For valley and ridge application, peel the release liner, center the sheet over the valley or ridge, drape, and press in place. Work from the center of the valley or ridge outward in each direction and start at the low point and Work up the roof.

4. Install membrane from low point of the roof with laps run to shed water. For steep slope applications, follow Manufacturer’s requirements and install underlayment vertically. End laps shall be blind nailed with metal head cap nails to hold the sheet in position.

### 3.4 INSTALLATION

**A. General:** Install metal roofing panels to profiles, patterns and drainage indicated and required for leak-proof installation. Provide for structural and thermal movement at Work. Seal joints for leak-proof installation.

1. **Seams:** Provide uniform, neat seams.

2. **Fasteners:** Conceal fasteners where possible in exposed Work. Cover and seal fasteners and anchors for watertight and leak-proof installation.

3. **Sealant-Type Joints:** Provide Manufacturer approved sealant-type joint where indicated. Form joints to conceal sealant.

4. **Clips:** Fasten in-seam clips in accordance with Manufacturer’s approved fastening pattern to meet project wind uplift requirements. Secure clips to the structural deck or members with approved fasteners on centers not to exceed 2-1/2’. Clip spacing shall be reduced at perimeter and corner zones in accordance with Manufacturer’s evaluation / approval report for the tested assembly.

### 3.5 FIELD QUALITY REQUIREMENTS

**A. Site Tests (Post Installation Testing):** Owner reserves right to perform post installation testing of installed sheet metal roofing.

**B. Manufacturer’s Field Services:** Manufacturer technical representative shall provide project field service consisting of review of project specifications, details and related shop drawings to ensure Contractor compliance with Manufacturer’s warranty requirements.
Field service shall include product use recommendations and minimum of two periodic site visits for inspection of product installation in accordance with manufacturer’s instructions.

3.6  CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent Work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer’s instructions prior to Owner’s acceptance. Remove construction debris from project site and legally dispose of debris.

3.7  PROTECTION

A. Protection: Protect installed product from damage during construction.

End of Section 07 4110
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.
C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.
K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
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 mastic, 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:
   6. Pearl Industries, Inc.: www.pearlandindustries.com
   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; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   3. 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.
   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.

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.

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.
   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 7100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.

C. Related Sections:
   1. Division 08 Section “Hollow Metal Doors and Frames”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:
   1. ANSI/BHMA Certified Product Standards - A156 Series
   2. UL10C – Positive Pressure Fire Tests of Door Assemblies
1.3 SUBMITTALS

A. Product Data: Manufacturer’s product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
   a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.
   c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
D. **Keying Schedule:** After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. **Informational Submittals:**
   1. **Product Test Reports:** Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. **Operating and Maintenance Manuals:** Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 **QUALITY ASSURANCE**

A. **Manufacturers Qualifications:** Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. **Installer Qualifications:** A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. **Door Hardware Supplier Qualifications:** Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. **Source Limitations:** Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
   2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. **Keying Conference:** Conduct conference to comply with requirements in Division 01 Section “Project Meetings.” Keying conference to incorporate the following criteria into the final keying schedule document:
   1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Five years for exit hardware.
3. Twenty five years for manual surface door closer bodies.
4. Twenty five years for manual surface door closer bodies.
5. Twenty five years for manual surface door closer bodies.
6. Five years for motorized electric latch retraction exit devices.
7. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
   a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
   b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:
   a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:
   a. McKinney Products
B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge, with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:
   a. Pemko Products; Mckinney Products

2.3 POWER TRANSFER DEVICES

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
   1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
   2. Furnish dust proof strikes for bottom bolts.
   3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
   4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:
   a. Rockwood Products; Trimco

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
   1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
   2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
   3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
   4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:
   a. Rockwood Products; Trimco

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
B. Cylinders: Original manufacturer cylinders complying with the following:
   1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
   2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
   4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

C. Permanent Cores: Match standard. Reference Division 01 for material required under project. Installation to be included under Division 08 "Door Hardware" base bid package.
   1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers’ cylinders.

D. Keying System: Each type of lock and cylinders to be factory keyed.
   1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
   2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
   3. Existing System: Key locks to Owner’s existing system.

E. Key Quantity: Provide the following minimum number of keys:
   2. Construction Control Keys (where required): Two (2).

F. Construction Keying: Provide temporary keyed construction cores.

G. Key Registration List (Bitting List):
   1. Furnish a list of opening numbers with locking devices, showing cylinder types and quantities required when cylinders or cores are to be owner furnished.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
1. Manufacturers:
   a. Stanley Best - 9K Series
   b. No Substitution.

2.7 AUXILIARY LOCKS

   A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

   1. Manufacturers:
      a. Stanley Best - 9K Series
      b. No Substitution.

2.8 LOCK AND LATCH STRIKES

   A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

      1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
      2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
      3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
      4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

   B. Standards: Comply with the following:

      2. Strikes for Bored Locks and Latches: BHMA A156.2.
      3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
      4. Dustproof Strikes: BHMA A156.16.

2.9 CONVENTIONAL EXIT DEVICES

   A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

      1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

      2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the
proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

6. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer’s heavy duty escutcheon trim with threaded studs for thru-bolts.
   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.


11. Extended cycle test: Devices to have been cycle tested in ordinance with ANSI/BHMA 156.3 requirements to 50 million cycles.

12. Rail Sizing: Provide exit device rails factory sized for proper door width application.

13. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

   1. Manufacturers:
      a. Sargent Manufacturing (SA) - 80 Series.
      b. No Substitution.
C. Extruded Aluminum Removable Mullions: ANSI/BHMA A156.3 anodized, removable mullions with malleable-iron top and bottom retainers. Mullions to be provided standard with stabilizers and imbedded weatherstrip.

1. Manufacturers:
   a. Sargent Manufacturing (SA) - 980/980A Series.

D. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

1. Provide keyed removable feature where specified in the Hardware Sets.
2. Provide stabilizers and mounting brackets as required.
3. Provide electrical quick connection wiring options as specified in the hardware sets.
4. Manufacturers:
   a. Corbin Russwin Hardware (RU) - 700/900 Series.

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer’s written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:
   a. Sargent Manufacturing (SA) - 1431 Series
   b. No Substitution.

2.11 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2” less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1” less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
   a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer’s designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:
   a. Rockwood Products; Strohmeyer Architects Inc Architectural Door Accessories (RO).

2.12 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
1. Manufacturers:
   a. Rockwood Products;

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:
   a. Rixson Door Controls (RF).
   b. Sargent Manufacturing (SA).

2.13 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

   1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.


D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

   1. Pemko Products; Strohmeyer Architects Inc Architectural Door Accessories (PE).

2.14 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.
2.15 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.


3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer’s published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section “Joint Sealants.”

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner’s maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.
SECTON 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 PPG Paints (noted PPG). Products of other manufacturers listed in paragraph 2.01 may be substituted with approved color matches.

C. Related Sections
   1. Section 05 2100 - Steel Joist Framing: Shop priming
   2. Section 05 5000 - Metal Fabrications: Shop priming
   3. Section 06 2000 - Finish Carpentry: Back priming of trim and paneling
   4. Division 23 - Mechanical Identification: Markers and color-coding
   5. Division 26 - Electrical Identification: Markers and color-coding

1.02 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.

1.03 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.

1.04 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 report. 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.

1.05 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.

1.06 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.

1.07 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.

1.08 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.
D. PPG Paints: www.ppgpaints.com
G. 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.

2.03 COLOR SCHEDULES
A. Color schedule in 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.

2.05 INTERIOR DRYWALL TEXTURING
A. Interior drywall texturing compounds shall be equal to U.S.G. "Multi-Purpose Texture Finish", or U.S.G. "Texture X II Drywall Surfacer". Unless shown or otherwise indicated on the drawings, provide medium "Orange Peel or Spatter Finish" texture on walls or ceilings, as directed by Architect.
   B. Mix 1 Gallon of latex paint with each 50 lbs. of texture.

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 PPG Perma-Crete. 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 PPG Perma-Crete.

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- PPG Speedhide Int/Ext 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 PPG Paints 6-4110X1 Speedhide zero Interior Zero VOC Flat Latex.
   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 PPG Paints 6-4110X1 Speedhide zero Interior Zero VOC Flat
   b. Second coat will be as directed by the Architect.

4. Varnished Surfaces to be Revarnished
   a. Repair scratches with PPG Paints Deft Int/Ext Polyurethane Satin DFT25 or Gloss DFT20SW

5. Enameled Trim:
   a. Apply one coat PPG Paints 17-921 Seal Grip 100 Percent Acrylic Universal Primer
   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 PPG Paints (noted PPG Paints on the schedule).

B. Where painting occurs in addition or renovation projects provide low odor finishes equal to PPG Paints Speedhide zero Interior Zero VOC Series Sherwin

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: PPG Paints 90-712 Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial
3. 2nd/3rd Coat: PPG Paints 90-474 Series Pitt-Tech Interior/Exterior Satin DTM Industrial Enamels

B. Code 100b - Exterior Metal
   1. Including aluminum and galvanized metals
   2. 1st/2nd Coat: PPG Paints 90-712 Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial

C. Code 100c - Exterior Metal
   1. For use where Zinc Epoxy is noted on the drawings over properly prepared blasted steel.
   2. 1st Coat: PPG Paints Amercoat 68G HS Zinc-Rich Epoxy Primer
   3. 2nd/3rd Coat: PPG Paints Amershield HS Polyurethane Epoxy Topcoat

D. Code 101 - Exterior Wood
   1. Including wood doors, screens and trim
   2. 1st Coat: PPG Paints 17-941NF Seal Grip Interior/Exterior Alkyd Primer
   3. 2nd/3rd Coat: PPG Paints 6-2045X I Series SpeedHide Exterior Satin-Acrylic Latex

E. Code 102a - Exterior CMU
   1. Except clay face brick, split face CMU, ground face/burnished CMU or cast stone:
   2. 1st Coat: PPG Paints 6-15 SpeedHide Interior/Exterior Acrylic Masonry Block Filler
   3. 2nd/3rd Coat: PPG Paints 6-2045X I Series SpeedHide Exterior Satin-Acrylic Latex

F. Code 102b - Exterior Cement Board
   1. 1st Coat: PPG Paints 4-603 Perma-Crete Interior/Exterior Alkali Resistant Primer
   2. 2nd/3rd Coat: PPG Paints 6-2045X I Series SpeedHide Exterior Satin-Acrylic Latex

G. Code 103 - Interior Wood (Natural Wood)
   1. 1st Coat: PPG Paints Deft Interior Oil Stain
   2. 2nd Coat: PPG Paints Deft Interior Oil Based Sanding Sealer DFT60 series
   3. 3rd Coat: PPG Paints Deft Int/Ext Polyurethane Satin DFT25 or Gloss DFT20

H. Code 104a - Interior Wood (Painted Surface, Enamel):
   1. 1st Coat: PPG Paints 17-921 Seal Grip 100 Percent Acrylic Universal Primer
   2. 2nd/3rd Coat: PPG Paints 6-4510X I Speedhide zero Interior Zero VOC Semi-Gloss Latex

I. Code 104b - Interior Metal (Painted Surface, Enamel)
   1. 1st Coat: PPG; 90-712 Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial Enamel

J. Code 105 - Interior Wood (Stain & Finish)
   1. 1st Coat: PPG Paints Deft Interior Oil Stain SW Wood Classics Interior Oil Stain, A49-200 series. (color as selected by Architect)
   2. 2nd Coat: PPG Paints 77-9100 Speedline Lacquer Sanding Sealer
   3. 3rd Coat: PPG Paints 77-9130 Speedline Satin Lacquer

K. Code 106 - Interior Masonry (Admin Areas)
   1. 1st Coat: PPG Paints 4-603 Perma-Crete Interior/Exterior Alkali Resistant Primer
   2. 2nd/3rd Coat: PPG; 6-4310X I Speedhide zero Interior Zero VOC Eggshell Latex

L. Code 107 - Interior Masonry (Corridors and Student Areas)
   1. 1st Coat: PPG Paints 4-603 Perma-Crete Interior/Exterior Alkali Resistant Primer
   2. 2nd/3rd Coat: PPG Paints 6-4510X I Speedhide zero Interior Zero VOC Semi-Gloss Latex

M. Code 108 - Interior Metal, Natatoriums (Painted Surface, Enamel)
2. 1st Coat: PPG Paints 97-699 Durethane MCZ Moisture Cure Urethane Zinc, DFT 3.0-4.0 mils
3. 2nd Coat: PPG Paints Amerlock 400 HS Epoxy, DFT 5.0-10.0 mils
4. 3rd Coat: PPG Paints Amershield HS Polyurethane Epoxy Topcoat, DFT 3.0-6.0 mils.
5. Total DFT 12.5-23 mils.

N. Code 109 - Floors (Two Component Epoxy Coating)
1. 1st Coat: PPG Paints 99-127 Megaseal HS Epoxy Primer/Sealer series
2. 2nd/3rd Coat: PPG Paints 95-1 Aquapon 35 Epoxy Gloss
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

O. Code 110a - Two Component Epoxy Coating for CMU Walls (All Food service Areas)
1. 1st Coat: PPG Paints 4-100 Perma-Crete Concrete Block & Masonry Surfacer/Filler. 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: PPG Paints Aquapon WB Water Base Epoxy 98 Series

P. Code 110b - Two Component Epoxy Coating for Gyp Board Walls (All Food service Areas)
1. 1st Coat: PPG Paints Speedhide zero Interior Zero VOC Latex Primer 6-4900X
2. 2nd/3rd Coat: PPG Paints Aquapon WB Water Base Epoxy 98 Series

Q. Code 110c - Epoxy for CMU Walls at "Wet/Shower" Areas, Restrooms, Vehicle Wash Bays, Natatoriums, Janitor, & Mechanical Rooms
1. 1st Coat: PPG Paints Amerlock2 HS Epoxy
2. 2nd/3rd Coat: PPG Paints Amerlock2 HS Epoxy

R. Code 110d - Epoxy for Gyp Board Walls at "Wet/Shower" Areas, Restrooms, Vehicle Wash Bays, Natatoriums, Janitor, & Mechanical Rooms
1. 1st Coat: PPG Paints Speedhide zero Interior Zero VOC Latex Primer 6-4900X
2. 2nd/3rd Coat: PPG Paints Aquapon WB Water Base Epoxy 98 Series

S. Code 111 - Exterior Concrete Walls (Painted or Unpainted)
1. After all work has been completed, apply 2 coats of Sure Klean "Weather Seal SS" as manufactured by Prosoco, Inc., Dallas, Texas or prior approved equal. Apply in full compliance with manufacturer's specifications.

T. Code 112 - Exterior Concrete or Stucco
1. 1st/2nd Coat: BASF MasterProtect HB 300SB. Apply according to manufacturer's specifications for complete coverage and comply with manufacturer's five year guarantee on labor and materials. Secure and deliver to the Architect the manufacturer's standard five year guarantee.

U. Code 113 - Not Used

V. Code 114 - Not Used

W. Code 115a - Interior Drywall (Admin Area Walls and Ceilings/Bulkheads)
1. 1st Coat: PPG Paints Speedhide zero Interior Zero VOC Latex Primer 6-4900X
2. 2nd/3rd Coat: PPG Paints 6-4310X I Speedhide zero Interior Zero VOC Eggshell Latex

X. Code 115b - Interior Plaster (Standard Ceilings/Bulkheads)
1. 1st Coat: PPG Paints Speedhide zero Interior Zero VOC Latex Primer 6-4900X
2. 2nd/3rd Coat: PPG Paints 6-4310X I Speedhide zero Interior Zero VOC Eggshell Latex

Y. Code 116a - Interior Drywall (Walls in Corridors and Student Areas)
1. 1st Coat: PPG Paints Speedhide zero Interior Zero VOC Latex Primer 6-4900X
2. 2nd/3rd Coat: PPG Paints 6-4510X I Speedhide zero Interior Zero VOC Semi-Gloss Latex
Z. Code 116b - Interior Plaster (High Humidity Ceilings)
   1. 1st Coat: PPG Paints Speedhide zero Interior Zero VOC Latex Primer 6-4900X
   2. 2nd/3rd Coat: PPG Paints Pitt Glaze WB1 Interior Pre-Catalyzed Semi-Gloss (16-510) or Eggshell (16-310) Acrylic Epoxy

AA. Code 117 - Exterior Masonry Surfaces
   1. 1st Coat: PPG Paints 4-603 Perma-Crete Interior/Exterior Alkali Resistant Primer
   2. 2nd/3rd Coat: PPG Paints 4-110 Perma-Crete Pitt-Flex Elastomeric Coating

AB. Code 118 - Not Used

AC. Code 119 - Existing Metal Lockers - Electrostatic Enamel
   1. Description: A single component modified acrylic enamel for use with electrostatic spray equipment.
   2. Surface Preparation: Surface must be clean and free of oils, grease, loose paint, rust, polish, waxes and moisture. Sand and remove all ropes and runs on existing metal lockers. Surface must have feathering around scratches. Test surface for priming and adhesion to determine if a base coat should be removed and primed.
   4. Primer: As recommended by manufacturer for existing application.
   5. Applicators
      a. Electro-Static Refinishers Inc., Dallas, TX; 972-296-2173
      b. ElectroCoat, Houston, TX; 800-508-9449

AD. Code 120 - Not Used

AE. Code 121 - Ceilings (Exposed Structural Steel and Deck)
   1. Touch-up factory prime coat on ferrous steel with PPG Paints 90-712 Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial
   2. 1st /2nd Coat: PPG Paints 6-715xi Series Speedhide Int WB Latex Dry-Fog Flat Finish

AF. Code 122 - Not Used

AG. Code 123 - Concrete Floor Sealer:
   1. Properly clean surface as per manufacturer's recommendations.
   2. 1st/2nd Coat: BASF MasterKure CC (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

AH. Code 124 - Structural & Miscellaneous Steel, Steel Bar Joists
   1. 1st Coat: PPG Paints 6-157 Speedhide SuperTech MG Interior Dry-Fog Flat Epoxy Ester

END OF SECTION
SECTION 09 9600
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. High performance coatings.
B. Surface preparation.

1.02 RELATED REQUIREMENTS
A. Section 09 9000 – Painting and Coating.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.
B. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years experience.

1.06 MOCK-UP
A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
B. Provide mock-up, long by wide, illustrating coating, color, and surface sheen.
C. Locate where directed.
D. Accepted mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS
A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
B. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
C. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
D. Restrict traffic from area where coating is being applied or is curing.

1.09 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. High-Performance Coatings:
   2. Substitutions: Section 01 6000 - Product Requirements.

2.02 TOP COAT MATERIALS
A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
B. Rubber Coating:
   1. Number of Coats: Two.
   2. Product Characteristics:
      a. Percentage of solids by volume, 100, minimum.
   3. Color: Custom color, unless otherwise indicated.
   4. Primer: As recommended by coating manufacturer for specific substrate.
C. Shellac: Pure, white type.

2.03 PRIMERS
A. Primers: Provide primer as required or recommended by coating manufacturer.

2.04 ACCESSORY MATERIALS
A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Do not begin application of coatings until substrates have been properly prepared.
C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
E. Proceed with coating application only after unacceptable conditions have been corrected.
   1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION
A. Clean surfaces of loose foreign matter.
B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
C. Remove finish hardware, fixture covers, and accessories and store.
D. Prepare surface as recommended by coating manufacturer in order to avoid imperfections from telegraphing to finished surface. Preparation may include, but not is limited to, applying and preparing 1/8 inch minimum thickness panels or skim coating.

E. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING
   A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
   B. Wood: Prior to priming patch with filler to produce smooth, even surface.

3.04 COATING APPLICATION
   A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual".
   B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 FIELD QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.06 CLEANING
   A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
   B. Clean surfaces immediately of overspray, splatter, and excess material.
   C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.07 PROTECTION
   A. Protect finished work from damage.

END OF SECTION
SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 RELATED SECTIONS

A. 090190.52 “Paint Removal” for removal of existing paint prior to application of new wood stain, where applicable.

1.3 SUMMARY

A. Section includes surface preparation and application of wood stains and transparent finishes on the following substrates:
   1. Exterior Substrates:
      a. Exposed glued-laminated beams and columns.
      b. Exposed framing.
      c. Exposed tongue & groove roof decking.
   2. Interior Substrates:
      a. Exposed glued-laminated beams and columns.
      b. Exposed framing.
      c. Exposed tongue & groove roof decking.
      d. Dressed lumber (finish carpentry or woodwork).
      e. Wood railings.

1.4 DEFINITIONS

A. MPI Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

D. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

E. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
   2. Indicate VOC content.
B. Samples for Verification: For each type of finish system and in each color and gloss of finish required.
1. Submit Samples on representative samples of actual wood substrates, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.6 MATERIAL SUBMITTALS
A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Stains and Transparent Finishes: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.7 QUALITY ASSURANCE
A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
   b. Other Items: Architect will designate items or areas required.
2. Final approval of stain color selections will be based on mockups.
   a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS
A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces.
C. Do not apply exterior finishes in snow, rain, fog, or mist.

Strohmeyer Architects Inc
PART 2 - PRODUCTS

2.1 BASIS OF DESIGN MANUFACTURERS

A. For interior and exterior transparent stains, and interior top coats:
   1. Minwax

B. For exterior top coats:
   1. Thompson Water Seal

C. Substitutions: Subject to the requirements of Section 016000 “Product Requirements”.

2.2 MATERIALS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."

B. Material Compatibility:
   1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, products shall be recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Stain Colors: As indicated in a color schedule

2.3 SOURCE QUALITY CONTROL

A. Testing of Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.

C. Maximum Moisture Content of Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with finish application only after unsatisfactory conditions have been corrected.
   1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
   1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
   1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
   2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

D. Exterior Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Prime edges, ends, faces, undersides, and backsides of wood.
      a. For solid hide stained wood, stain edges and ends after priming.
      b. For varnish-coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.
   3. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.

E. Interior Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
   3. Sand surfaces exposed to view and dust off.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.
3.3 APPLICATION

A. Apply finishes according to manufacturer’s written instructions and recommendations in "MPI Architectural Painting Specification Manual."
   1. Use applicators and techniques suited for finish and substrate indicated.
   2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
   3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

1. Clear, Two-Component Polyurethane Varnish over Stain System MPI EXT 6.1E:
      1) Minwax Wood Finish
   b. First Intermediate Coat: Varnish, aliphatic polyurethane, two component, matching topcoat.
   d. Topcoat: Varnish, aliphatic polyurethane, two component (MPI Gloss Level 6 or 7).
      1) Minwas Pro Series Spar Urethane

3.6 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood Substrates: Glued-laminated construction, Exposed wood framing, Exposed Tongue & Groove decking, wood wall base, and railing components:
   1. Polyurethane Varnish over Stain System MPI INT 6.1J:
      a. Stain Coat: Stain, semitransparent, for interior wood, MPI #90.
         1) Minwax Wood Finish.
      d. Topcoats:
1) For Glued-laminated construction, exposed wood framing exposed tongue & groove decking and wood wall base:
   a) Varnish, interior, polyurethane, oil modified, satin (MPI Gloss Level 4).
   b) Minwax Polycrylic Protective Finish

2) For railing components:
   a) Varnish, interior, polyurethane, oil modified, semi-gloss (MPI Gloss Level 5).
   b) Minwax Polycrylic Protective Finish
# PLUMBING

## DIVISION 22

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 00 10</td>
<td>Basic Plumbing Requirements</td>
</tr>
<tr>
<td>22 00 90</td>
<td>Plumbing Submittal Procedures</td>
</tr>
<tr>
<td>22 05 24</td>
<td>Valves - General</td>
</tr>
<tr>
<td>22 05 30</td>
<td>Pipe And Pipe Fittings - General</td>
</tr>
<tr>
<td>22 05 54</td>
<td>Plumbing Identification</td>
</tr>
<tr>
<td>22 07 20</td>
<td>Piping Insulation</td>
</tr>
<tr>
<td>22 11 17</td>
<td>Domestic Water Piping &amp; Appurtenances</td>
</tr>
<tr>
<td>22 13 17</td>
<td>Soil, Waste &amp; Sanitary Drain Piping, Vent Piping &amp; Appurtenances</td>
</tr>
<tr>
<td>22 33 34</td>
<td>Access Doors</td>
</tr>
<tr>
<td>22 40 01</td>
<td>Plumbing Fixtures And Fixture Carriers</td>
</tr>
</tbody>
</table>

[Signature]

Jason W. Reed  
105129  
Professional Engineer  
12-18-19
SECTION 22 00 10

BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

A. Basic plumbing requirements necessary to provide complete installation of all Division 22 work.

1.3 WORK INCLUDED

A. This section of work comprises furnishing of all materials, equipment, tools, scaffolding, rigging, hoisting, labor and transportation necessary for the complete installation of the plumbing systems as shown on the plans and as specified herein.

B. Bidders shall determine the contents of a complete set of drawings and specifications and be aware that they may be bidding from a partial set of drawings, applicable only to the various separate contracts, subcontracts, or trades as may be issued for bidding purposes only. The contract documents and the complete scope of work for the project are illustrated on the combined Architectural, Structural, Mechanical, Heating, Ventilating, Air Conditioning, Plumbing and Electrical, and each Bidder shall thoroughly acquaint himself with all the details of the complete set of drawings and specifications before submitting his bid.

C. All drawings and specifications form a part of the contract documents for each separate contract and shall be considered as bound therewith in the event partial sets of plans and specifications are issued for bidding only. The submission of bids shall be deemed evidence of the review and examination of all drawings, specifications, and addenda issued for this project as no allowances will be made because of unfamiliarity with any portion of the complete set of documents.

D. Plumbing Contractor is responsible for all final connections to specified plumbing fixtures and all owner furnished equipment requiring plumbing (drain, water, gas, condensate, air).

1.4 RELATED SECTIONS

A. The conditions of the Division 01 requirements and the contract requirements which include the General Conditions and the Supplementary Conditions apply to the work of this division.

1.5 CODES & REFERENCE STANDARDS

A. General

1. Perform all Division 22 work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are modified by the contract documents.

2. Nothing in the Contract Documents shall be construed to permit work not conforming to these codes.

3. When two or more codes or standards are applicable to the same work, then the stricter code or standard shall govern.
The date of the code or standard that is in effect on the date of issue of the contract documents except when a particular publication date is specified.

The Contractor shall be held responsible for verifying all local codes and ordinances that may alter any part of the plans or specifications. The Contractor shall bear all costs for correcting the deficiencies.

Where local codes and ordinances are not in writing or on record but a local precedence has been set, the Owner shall pay for any additional cost incurred.

1.6 APPLICABLE CODES AND STANDARDS FOR ALL DIVISIONS 22 WORK

A. International Building Code
B. International Gas Code
C. International Plumbing Code
D. International Mechanical Code
E. International Energy Conservation Code
F. National Electrical Code
G. American Society of Heating, Refrigerating and Air Conditioning Engineers Standards.
H. Occupational Safety and Health Administration Standards:
   1. OSHA Standard 2207 - Construction Industry Standards
   2. OSHA 29 CFR Part 1926 – Regulation of Excavation
   3. Texas Underground Facility Damage Prevention Act (H.B. 2295)
   4. All other applicable standards
I. National Fire Protection Association:
   1. NFPA No. 90A Installation of Air Conditioning and Ventilating Systems
K. Texas State Board of Insurance Standards
L. Clean Air Act and Clean Air Act Amendments of 1990
M. State Codes:
   1. Texas Department of Labor Boiler Rules and Regulations
   2. All other applicable codes
N. Local Municipal Codes and Ordinances
O. Schedule of Abbreviations:
   1. Reference Standards are listed in Division 22 using abbreviations listed below:
      AABC Associated Air Balance Council
      AASHTO American Association of State Highway and Transportation Officials
      ADA Americans with Disabilities Act
      AGA American Gas Association
      ANSI American National Standards Institute
      ASME American Society of Mechanical Engineers
      ASPE American Society of Plumbing Engineers
      ASTM American Society for Testing and Materials
      AWE American Welding Society
1.7 QUALITY ASSURANCE

A. Provide complete installations of all systems.

B. Furnish all items of equipment, material, and labor to complete the Contract even though each and every item necessary is not specifically mentioned or shown.

C. In case of any conflict between the specifications, plans and ordinances, the ordinances shall govern.

D. All materials furnished under this Contract shall be new, free from defects of any kind, of the quality and design hereinafter specified, and shall conform to the standards of Underwriter's Laboratories Inc., except for equipment which U.L. does not list or provide label service.

E. All plumbing equipment and fixtures shall be the same brand unless scheduled differently on plans.

1.8 CONTRACTOR'S RESPONSIBILITY

A. Erect barricades, protective fencing, and signs to prevent injury to personnel on site.

B. Make permanent connection to utilities or existing lines. Determine depth and location, and bid accordingly.

C. Relocate and repair any existing lines cut by general construction work.

D. Pay all costs in connection with metering devices.

E. Plans do not show exact location and elevations of lines, nor do they show all offsets required.

F. Deviate from plans as required to conform to the general construction and provide proper grading.

G. Maintain all utility services during construction to existing portions of job that remain.
H. Procure and pay for all necessary permits or licenses to carry out the work.

I. Obtain and pay for all the necessary certificates of approval which must be delivered to the Architect before final acceptance of the work.

J. Periodically remove rubbish, clean or repair all surfaces marred by the work required under this contract.

K. Protect work from damage by other trades.

L. Make all tests required by law; pay all costs in connection with the testing.

M. Where job conditions require changes in indicated locations and arrangement, make such changes without extra cost to Owner.

N. Provide motor starters, controls, relays, all low-voltage wiring, conduit and wiring related to plumbing and other equipment and devices to form a complete working system. See Division 26 00 00.

1.9 DEFINITIONS

A. Approval:
   1. It is understood that approval must be obtained from the Architect in writing before proceeding with the proposed work.
   2. Approval by the Architect of any changes, submitted by the Contractor will be considered as general only to aid the Contractor in expediting his work.

B. Contractor:
   1. The Contractor engaged to execute the work included in a particular section only, even though he may be technically described as a Subcontractor to the General Contractor.
   2. If the Contractor engaged to execute said work employs Sub-Contractors to perform various portions of the work included under this Section, he shall be held responsible for the execution of same, in full conformity with Contract Document requirements.
   3. The Contractor shall cooperate at all times and shall be responsible for the satisfactory cooperation of his Subcontractors with the other Contractors on the job so that all of the various phases of the work may be properly coordinated without unnecessary delays or damage to any parts of the work of any Contractor.

C. Provide:
   1. Defined as requiring the furnishing and installing of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically noted.

1.10 WARRANTY

A. The Contractor shall warranty his work against defective materials and workmanship for a period of one year from date of acceptance of the job.

B. Neither the final payment nor any provisions in Contract Documents shall relieve the Contractor of the responsibility for faulty materials or workmanship.

C. He shall remedy any defects due thereto, and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from date of substantial completion.

D. The Owner shall give notice of observed defects with reasonable promptness.
E. This Guarantee shall not be construed to include the normal maintenance of the various
components of the system covered by these specifications.

1.11 SITE VISIT

A. Before submitting his proposal, each bidder shall examine all plans and specifications relating
to the work, shall visit the site of the project and become fully informed of the extent and
character of the work required.

B. No consideration will be granted for any alleged misunderstanding of the materials to be
furnished or the amount of work to be done, it being fully understood that the tender of a
proposal carries with it the agreement to all items and conditions referred to herein, or
indicated on the accompanying plans or required by nature of the site of which may be fairly
implied as essential to the execution and completion of any and all parts of the work.

1.12 PROJECT RECORD DOCUMENTS

A. The Contractor shall keep a set of plans on the job, noting daily all changes made in
connection with the final installation including exact dimensioned locations of all new and
uncovered existing utility piping outside the building.

B. Upon submitting his request for final payment, he shall turn over to the Architect/Engineer, for
subsequent transmittal to the Owner, a clean, neatly marked set of reproducible plans showing
"as installed" work and an electronic file with changes of materials.

C. In addition to the above, the Contractor shall accumulate during the job's progress the
following data, in duplication (2 each), prepared in 3 ring binders of sufficient size, black in
color, neat in appearance, and turned over to the Architect/Engineer for checking and
subsequent delivery to the Owner:
   1. All warranties, guarantees and manufacturer's directions on equipment and material
covered by the Contract.
   2. Approved fixture brochures.
   3. Copies of reviewed shop drawings.
   4. Set of operating instructions. Operating instructions shall also include recommended
      maintenance.
   5. Any and all other data and/or plans required during construction.
   6. Repair parts lists of all major items and equipment including name, address and
      telephone number of local supplier or agent.
   7. The first page, or pages, shall have the names, addresses, and telephone numbers of
      the following:
      a. General Contractor and all sub-contractors.
      b. Major Equipment Suppliers.

1.13 TRAINING

A. Upon completion of the work and at a time designated by the Owner's representative, provide
a formal training session for the Owner's operating personnel to include location, operation,
and maintenance of all plumbing equipment and systems, some sections have further
instructions.

B. Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects that
will be covered. Submit the outline for review by the Owner's representative.
C. At the conclusion of the instruction, obtain the signatures of the attendees on each copy of the outline to signify that they have a proper understanding of the operation and maintenance of the system. Submit the signed outlines to the Owner’s representative and Engineer as a condition of final acceptance.

1.14 PLANS AND SPECIFICATIONS

A. The plans show diagrammatically the locations of the various lines, ducts, conduits, fixtures, and equipment and the method of connecting and controlling them.

B. It is not intended to show every connection in detail and all fittings required for a complete system.

C. The systems shall include but are not limited to the items shown on the plans.

D. Exact locations of these items shall be determined by reference to the general plans and measurements of the building and in cooperation with other Contractors, and in all cases, shall be subject to the approval of the Architect/Engineer.

E. The Architect/Engineer reserves the right to make any reasonable change in the location of any part of this work without additional cost to the Owner.

F. Contractor, subcontractor, vendors and suppliers are required to waive subrogation against Owner and Engineer.

1.15 UTILITIES, LOCATIONS, AND ELEVATIONS

A. Locations and elevations of the various utilities within the scope of this work have been obtained from the City and/or other substantially reliable sources and are offered separately from the Contract documents, as a general guide only, without guarantees as to accuracy.

B. The Contractor shall examine the site, shall verify to his own satisfaction the locations, elevations and availability of all utilities and services required, and shall adequately inform himself as to their relation to the work; the submission of bids shall be deemed evidence thereof.

C. The Contractor shall coordinate all services with the Utility Companies during construction, coordinate changes made by Utility Companies to the design of project, and coordinate with the Owner, Architect/Engineer, and Utility the scheduling of any shutdowns or delays that may occur in providing service.

D. The Contractor shall verify location, conduct all necessary tests, inspections, coordinate with Owner’s representatives and utilities, and check for existing underground utilities and lines before ditching.

E. The Contractor shall be responsible for repair of any cut or damaged lines or utilities he uncovers. There are lines and utilities not shown on any plans.

F. Contractor is responsible for coordination of all existing and new utilities at site. Contractor is responsible for protecting and repairing any utilities damaged by installation of pipe. All existing and new landscaping/trees to remain and to be protected unless directed otherwise by Architect/Owner.
1.16 SUBSTITUTION OF PRODUCTS

A. Substitution of products specified herein will be considered only when a complete list of proposed alternative equipment is submitted to the Engineer in writing, supported by adequate technical and cost data. This includes a complete description of the proposed substitution, drawings, catalog cuts, performance data, test data, or any other data or information necessary for evaluation.

B. All proposed substitutions and data must be received by the Engineer no less than ten working days prior to the schedule date for opening of bids.

C. The Engineer will consider all such submittals and the Architect will issue an addendum listing items which the Engineer considers acceptable. Only such items as specified or approved as acceptable will be installed on this project.

D. Manufacturers' names are listed herein and on the plans to establish a standard of quality and design. Where a manufacturer's name is mentioned, products of other manufacturers will be acceptable, if in the opinion of the Engineer, the substitute material is of equivalent quality or better than that of the material specified.

E. The Contractor's Bid represents that the bid price is based solely upon the materials and equipment described in the Bid Documents (including addenda, if any) and that he contemplates no substitutions or extras.

F. Requests for substitution are understood to mean that the Contractor:
1. Has personally investigated the proposed substitution and determined that it is equal or superior in all respects to that specified.
2. Will provide the same guarantee for the substitution that he would for that specified.
3. Will, at no cost to the Owner, replace the substitute item with the specified product if the substitute item fails to perform satisfactorily.

G. After Award of the Contract, substitutions will be considered only under one or more of the following circumstances:
1. The substitution is required for compliance with subsequent interpretations of code or insurance requirements.
2. The specified product is unavailable through no fault of the Contractor.
3. The manufacturer refuses to warranty the specified products as required.
4. Subsequent information that the specified product is unable to perform properly or to fit in the designated space.
5. In the Engineer's sole judgment, the substitution would be in the Owner's best interest.

H. Revisions to the plumbing system shall be under the supervision of the Engineer at a standard hourly rate charged by the Engineer and shall be paid by the Contractor originating the changes.

1.17 PROTECTION OF EQUIPMENT AND MATERIALS

A. The Contractor shall take such precautions as may be necessary to properly protect his apparatus from damage.

B. This shall include the creation of all required temporary shelters to adequately protect any apparatus above the floor of the construction and the covering of apparatus in the completed building with tarpaulins or other protective covering.
C. Failure to comply with the above to the satisfaction of the Owner's inspector will be sufficient cause for the rejection of the equipment in question and its complete replacement by this Contractor.

D. All apparatus shall be cribbed up from the floor or ground by the Contractor and covered with tarpaulins or other protective covering where necessary or directed.

1.18 FINAL INSPECTION

A. It shall be the duty of this Contractor to make a careful inspection trip of the entire project, assuring himself that the work on the project is ready for final acceptance before calling upon the Architect/Engineer to make a final inspection.

B. To avoid delay of final acceptance of the work, the Contractor shall have all necessary bonds, warranties, receipts, affidavits, etc., called for in the various articles of these specifications, prepared and signed in advance, together with a letter of transmittal, listing each paper included, and shall deliver the same to the Architect/Engineer at or before the time of said final inspection. The Contractor is cautioned to check over each bond, receipt, etc., before preparing for submission to verify that the terms check with the requirements of the specifications.

1.19 CUTTING AND PATCHING

A. All Subcontractors shall notify the General Contractor sufficiently ahead of construction of any floors, walls, ceiling, roof, etc., of any openings that will be required for his work.

B. He shall see that all sleeves required for his work are set at proper times so as to avoid delay of the job.

C. All necessary cutting of walls, floors, partitions, ceilings, etc., as required for the proper installation of the work under this Contract shall be done at the Subcontractor's expense in a neat and workmanlike manner, and as approved by the Architect/Engineer.

D. No joists, beams, girders or columns shall be cut by any Contractor without first obtaining written permission of the Architect/Engineer.

E. Patching of openings and/or alterations shall be provided by the General Contractor.

F. All openings in firewalls and floors, such as thimbles, shall be completely sealed after installation for a completely airtight and watertight installation. Sealing material shall be non-combustible and UL approved. The installed sealing assembly shall not cause the fire rating of the penetrated structure to be decreased.

G. All openings in exterior walls shall be sealed watertight.

1.20 IDENTIFICATION

A. Refer to Section 22 05 54.

1.21 MANUFACTURER'S INSTRUCTIONS

A. All equipment and devices shall be installed in accordance with these plans and specifications, manufacturer's instructions and applicable codes.
B. Where specifications call for installation of a product to be in accordance with manufacturer's instructions and/or where manufacturer's instructions are required for installation of a product, it shall be the Contractor's responsibility to obtain the necessary applicable manufacturer's instructions and install the product in accordance with the manufacturer's instructions.

C. It shall be the Contractor's responsibility to install all equipment, materials, and devices shown on the plans and as called out in these specifications even if manufacturer's instructions are absolutely unattainable.

1.22 RELATED WORK

A. The various specification sections for this division may or may not include related work listings.

B. All related work shall be coordinated and provided by the Contractor regardless whether specifically identified or not.

1.23 ELECTRICAL WIRING AND EQUIPMENT FOR PLUMBING SYSTEMS

A. All wiring, conduit, boxes, equipment (controls, thermostats, relays, contactors, motor starters, heaters, switches) and any other control devices or equipment required to form a complete and properly operating system, shall be the responsibility of this Contractor.

B. The Electrical Contractor shall only provide line voltage (including hook-up) to all plumbing equipment.

C. All controls and devices shall be low voltage unless otherwise noted or shown on the plans. Where line voltage controls or devices are noted, the Contractor shall provide complete wiring diagrams (approved by the Engineer) to the Electrical Contractor prior to final hook-up.

D. The Plumbing and Electrical plans are based on the equipment and devices scheduled as shown on the plans or as called for in the specifications. Should any plumbing equipment or device be changed or approved from those which are shown or noted, all electrical and/or plumbing changes shall be made at the expense of the trade or Contractor initiating the change with no expense to the Owner, Architect, Engineer or their representatives.

E. All wiring provided by this Contractor shall be installed in a workmanlike manner using tie wraps, labels, anchors and etc. Loose wiring is not acceptable.

F. All conduit and boxes required in all walls for control purposes (thermostats, switches, etc.) shall be provided by electrical contractor.

G. All conduit required in attic, clear spaces, or on roof shall be by electrical Contractor.

1.24 OPERATION PRIOR TO COMPLETION

A. When any piece of plumbing equipment is operable and the Contractor needs to operate the equipment, he may do so providing that he properly supervises the operation.

B. The warranty period shall, however, not commence until such time as the equipment is operated for the beneficial use of the Owner.

C. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install clean filter media, properly adjust and complete all punch list items before final acceptance by the Owner.

D. The date of acceptance and the start of the warranty may not be the same date.
1.25 SAFETY GUARDS

A. Contractor shall furnish and install all safety guards required. All belt driven equipment, projecting shafts and other rotating parts shall be enclosed or adequately guarded.

1.26 FLAME SPREAD PROPERTIES OF MATERIALS

A. All materials and adhesives used for plumbing and insulation shall conform to NFPA and UL life and flame spread properties of materials.

B. The composite classifications shall not exceed 25 for a flame spread rating and 50 for a smoke developed rating as listed for the basic material, the finishes, adhesives, etc., specified for each system and shall be such when completely assembled.

1.27 ASBESTOS

A. No asbestos or asbestos containing materials shall be permitted in this project.

1.28 LEAD MATERIALS

A. No lead or lead containing materials shall be allowed in any domestic or potable water supply piping, valves, fixtures, components, equipment or any other item.

1.29 REFRIGERANTS

A. Chlorofluorocarbons (CFCs) shall not be allowed in any equipment on this project.

B. Comply with ASHRAE Standards 15 and 34.

1.30 REFRIGERANT RECOVERY AND RECYCLE

A. Refrigerants shall not be released to the environment.

B. Contractor shall provide recovery and recycle equipment that has been certified by the Electrical Testing Laboratories or Underwriters Laboratories.

C. Contractor shall also provide properly trained and certified (in accordance with EPA) personnel for refrigerant work during installation, demolition, start-up, servicing, etc.

1.31 ACCESS CLEARANCE

A. Proper access to all installed equipment shall be provided. This Contractor shall label all points of access immediately upon installation with a marker pen.

B. A minimum of 3 feet shall be maintained in front of all access points.

C. If another trade violates this space, this Contractor shall immediately notify the General Contractor to correct this condition.

D. When equipment is installed above lay-in ceiling this Contractor shall coordinate with the Ceiling Contractor to provide access without removing part of T-bar ceiling.

E. No speakers, lights, fire alarm equipment, etc. shall be installed in lay-in ceiling tiles where access is to be gained.
PART 2 PRODUCTS

A. Not Applicable

PART 3 EXECUTION

3.1 TESTING

A. After all plumbing systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation regardless of the season the Contractor shall test all plumbing equipment.

B. Perform a smoke test on all sanitary sewers and camera all lines and provide owner with a video tape.

C. Perform gas piping pressure test to comply with HB 1611 and all required City or governing body tests.

D. Make adjustments as required to ensure proper functioning of all systems.

E. Special tests on individual systems are specified under individual sections.

3.2 AS BUILT DRAWINGS

A. Upon substantial completion, Contractor shall submit as built drawings showing all deviations between contract drawings and actual installed conditions.

B. Show location of all valves in gas and water piping. Submit to Owner.

END OF SECTION
SECTION 22 00 90

PLUMBING SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements Division 01 Submittal Procedures and contains additional requirements applicable to Division 22 submittals.

1.2 SECTION INCLUDES

A. This section includes, but is not limited to:

1. Plumbing submittal procedures

2. List of required Division 22 submittals to the engineer

3. This section applies only to the Division 22 specifications. Submittals required by other specification divisions are not included here, even though the same subcontractor may be providing work under other divisions.

1.3 RELATED SECTION

A. Division 01 – Submittal Procedures

1.4 DEFINITIONS

A. Product Data: Illustrations, standard schedules, performance charts, instructions, and brochures furnished by the contractor, subcontractor, manufacturer, or supplier to illustrate materials or equipment or to illustrate some portion of the work. Provide a summary of scheduled items with all data in schedules.

B. Shop Drawings: 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.

C. Equipment/Material Submittal Package: A compilation of the product data, shop drawings, and other items as required by the specifications, submitted near the start of the work. Typically, the specifications require the initial submittal package to be submitted within a certain number of days after the work starts.

D. Quality Assurance Submittal: Items submitted before and during the execution of a particular portion of the work for the purpose of guarding against defects and deficiencies.

E. Quality Control Submittal: Items submitted at the completion of a particular portion of the work for the purpose of evaluating completed activities and elements of the work for conformance with contract requirements (e.g. start-up reports).

F. Closeout Submittals: Items submitted at or near the completion of the contract.

1.5 SUBMITTALS

A. The materials, workmanship, design, and arrangement of all work installed under this contract shall be subject to the review of the architect, engineer and owner.
B. Manufacturers: Manufacturers submitted shall be as per the acceptable manufacturers listed in each specification section or referenced schedule. For additional manufacturers requiring approval, reference the Substitution of Products article in Section 22 00 10.

C. Required Submittals: Refer to the Submittals article of each individual Division 22 specification section for the required items to be submitted.

D. Contractor’s Coordination Submittals: The contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the project, but such data shall remain between the contractor and his subcontractors and will not be reviewed by the engineer.

E. Electronic Submittals: E-mail or other electronic forms of submittals from the contractor are required. The procedures described in this section shall be as follows:
   1. The contractor shall supply one electronic copy of the submittal.
   2. The electronic files will either be e-mailed to the architect, or posted to a project management and information exchange web site, depending on the architect’s requirements. The architect and contractor can distribute copies of the files as desired.
   3. The engineer will retain an electronic copy of the submittal and all responses.

F. Coordination Correspondence: The contractor may desire to verify the acceptability of a particular item prior to assembling the initial submittal package. The contractor may send material directly to the engineer for comments and feedback. This communication will be treated as normal coordination correspondence and will not be tracked or documented as a formal submittal. The engineer may or may not respond to such correspondence. If the engineer agrees, in writing, to the use of a particular item, then that same material shall be included in the initial submittal package along with a copy of the correspondence.

G. Unapproved Products: If materials or equipment are installed before being reviewed and approved by the engineer, the contractor shall be liable for the removal and replacement of such unapproved materials and equipment, at no additional expense to the owner. Additionally, if the removal and replacement of unapproved materials or equipment necessitates the removal and replacement of other related materials or equipment, then the contractor shall be liable for the removal and replacement of the related materials and equipment at no additional expense to the owner.

H. Product Data:
   1. Where the content of manufacturer submittal literature includes data not pertinent to the submittal, clearly indicate which portions of the contents are being submitted for review. Catalogs, pamphlets, or other documents submitted to describe items on which review is being requested shall be specific and identifications in catalog, pamphlets, etc., of items submitted shall be clearly made in a contrasting ink or highlighting. Data of a general nature shall not be acceptable.

I. Shop Drawings:
   1. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the item.
   2. Electronic shop drawing submittals are required.

1.6 QUALITY ASSURANCE / CONTROL SUBMITTALS

A. Quality assurance and quality control submittals may be in the form of documentation, or may be in the form of completed physical work that is offered for review by the engineer, architect, or owner.

B. If documentation is the subject, then submit in a manner similar to the initial submittal package.
C. If completed physical work is the subject, then the work shall not be concealed, nor shall subsequent work be performed, until the engineer’s representative has reviewed the work. If the work is concealed, or if subsequent work is performed, before the engineer’s representative has reviewed the work, then the contractor shall be liable for removal and replacement at no additional expense to the owner.

D. Sequencing:
   1. Within 30 calendar days after the contractor has received the owner’s notice to proceed, provide the complete submittal package.
   2. After the engineer has reviewed the submittal package, make necessary revisions to the submittals as directed by the engineer and resubmit.
   3. After the submittal has been reviewed by the engineer, proceed to purchase materials and perform the work.

E. Scheduling:
   1. Failure to submit items that meet the requirements of the contract documents in ample time for review shall not entitle the contractor to an extension of contract time, and no claim for extension by reason of such default shall be allowed. The contractor may be held liable for delays so occasioned.

PART 2 PRODUCTS

A. Not applicable

PART 3 EXECUTION

3.1 SUBMITTALS

A. Make submittals of product data, shop drawings, samples, quality assurance submittals, quality control submittals, and other items in accordance with the requirements of this section, applicable sections in Division 22, and additional requirements of each individual Division 22 specification section.

B. Grouping of Submittals:
   1. The submittal package shall be coordinated and included in a single submission. Multiple submissions are not acceptable except where prior written approval has been obtained from the engineer. Partial submittals may be rejected, without being reviewed, as not complying with the provisions of the contract.
   2. In the case that multiple submissions are approved, it is the responsibility of the contractor to maintain and update a submittal check list. The contractor shall ensure that all applicable submittal sections are submitted to the Engineer. If a submittal section is not submitted, it will be considered rejected until reviewed by the Engineer.
   3. If submittal sections are submitted as individual submittal files, the submittal sections will be grouped and returned as one file with one set of submittal responses.

C. Electronic Submittal Organization:
   1. Electronic submittals are to be submitted as a single PDF file. Within the PDF file, each section shall be bookmarked.
   2. Provide an electronic submittal cover sheet that lists at least the following:
      a. Project name
      b. Date
      c. Name and address of architect
      d. Name and address of engineer
e. Name, address and telephone number of prime contractor
f. Name, address and telephone number of HVAC contractor
g. Name, address and telephone number of HVAC supplier

3. Provide an electronic index sheet listing all items submitted.

4. The contractor shall call to the attention of the engineer, clouded in the submittal and noted after the index sheet, any instance in which the submittals are known to differ from the requirements of the contract documents.

5. Organize all required items by specification section. The material for each specification section shall be organized as follows:
   a. Provide an electronic section cover sheet that lists the same information as the submittal cover sheet, plus the specification number and title and the name, address and telephone number of the vendor or vendor’s representative, if applicable.
   b. Refer to the individual Division 22 specification sections for any required organization of the submittal material within each submittal section.
   c. Bookmarked sections shall be arranged by specification section number in numerical order.
   d. Submit in accordance with these procedures and procedures described in Division 01 Submittal Procedures.
   e. Submittals not organized as described here may be rejected, without being reviewed, as not complying with the provisions of the contract.

D. Response to engineer’s review:

1. Review comments:
   a. Review comments of the engineer will either be shown on the returned sets to the contractor, or shown on a document attached to the sets. If the comments are on an attached document, then the engineer will place a note on the submittal referring to the attached comments. In such cases, the engineer’s signature will appear only on the attached document. If the attached, signed document becomes physically separated from the submittal, then the submittal will no longer be considered as being a reviewed submittal.

2. Complete rejection:
   a. If the submittal is not complete or does not meet the requirements of this specification section, then the engineer may reject the entire submittal and return the submittal without further review or comment. In such cases, the entire submittal shall be completely revised and resubmitted. The resubmittal shall be given a new submittal number and shall be documented and processed as a separate submittal from the original.

3. Held for completion:
   a. If the submittal is not complete, but is only missing some minor item, the engineer may, at the engineer’s sole discretion, hold the submittal rather than rejecting and returning the submittal. In such cases, the engineer will notify the architect and contractor that the submittal is being held for completion. The contractor will be given a predetermined amount of time to provide the missing item. Upon receipt of the missing item, the engineer will insert the missing item into the submittal package and proceed with the review process.

4. Partial rejection:
   a. The engineer may reject only certain portions of the submittal. In such cases, only those rejected portions or items need to be revised and resubmitted.

5. Provide as corrected:
   a. The engineer may note a required change to a submitted item, but may not consider the change serious enough to require a resubmittal. In such cases, the engineer will note that the item is to be provided as noted or corrected. In such cases, the contractor may proceed to provide the item. However, if subsequent observations reveal that the noted change was not made, then the contractor shall be liable for removal and replacement of the item at no additional cost to the owner.
6. Reviewed without comment:
   a. The contractor may proceed to provide all materials and equipment.

E. Close-out Submittals:
   1. Provide close-out submittals in accordance with the requirements of Division 1.

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<td>18 gauge copper wire for underground gas piping</td>
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<td>Closed cell only in concrete masonry walls</td>
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<td>2” wrap for concealed roof drain piping</td>
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<td>2” wrap with PVC jacketing on exposed roof drains</td>
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<td>1” for lines in exterior walls</td>
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<td>22 11 17</td>
<td><strong>Domestic Water Piping and Appurtenances</strong></td>
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<td>Pipe Fittings</td>
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<td>a.</td>
<td>Up to 1-1/2&quot; - 95-1/2% tin, 4% copper, 1/2% silver</td>
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<td>2&quot; and up - SILFOS 15% silver, 80% copper, 5% phosphorus</td>
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<td>c.</td>
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<td>Valves</td>
<td>same as valves general</td>
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<td>Water hammer arrestors</td>
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<td>Freeze protection heat trace</td>
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<td>Copper DWV on exposed kitchen indirect waste</td>
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<td>22 33 34</td>
<td>Access Doors</td>
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<td>Stainless steel for kitchens and locker/shower areas</td>
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<td>Primer steel access doors for general use</td>
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<td>22 40 01</td>
<td>Plumbing Fixtures and Carriers</td>
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<td>Sinks - standard, ADA, TAS</td>
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<td>Hose bibbs - exterior, interior, roof</td>
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<td>Thermostatic mixing valves</td>
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1 - Reviewed
2 - Furnish as corrected in comments, resubmit not required
3 - Revise and Resubmit based on comments
4 - Rejected based on comments

END OF SECTION
SECTION 22 05 24
VALVES - GENERAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

A. General requirements for valves

1.3 RELATED SECTIONS

A. Section 22 00 10 - Basic Plumbing Requirements
B. Section 22 05 30 - Pipe and Pipe Fittings - General
C. Section 22 11 17 - Domestic Water Piping and Appurtenances

1.4 REFERENCES

A. ASTM 763 - Standard Specification for Copper Alloy Sand Castings for Valve Applications
B. ASTM 61 - Standard Specification For Steam or Valve Bronze Castings
C. ASTM C27450 - Standard Specification for Brass Rod, Bar & Shapes
E. ASTM A105 - Standard Specification for Carbon Steel Forgings for Piping Applications
F. ASTM - American Society of Testing Materials
G. ASTM A216 - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service
H. ASTM B813-00e1 - Standard Specification for Liquid & Paste Fluxes for Soldering of Copper & Copper Alloy Tube
I. ASTM B828-02 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
J. ASTM B88-02 - Standard Specification for Seamless Copper Water Tube
K. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings
L. PDI - Plumbing & Drainage Institute
1.5 QUALITY ASSURANCE
   A. Manufacturer to stamp valve to show that shell and seat tests have been successfully completed.

1.6 SUBMITTALS
   A. Provide submittal data on all items specified in this section in accordance with Specification Section 22 00 10, General Conditions, and Division 01.

PART 2 PRODUCTS

2.1 MATERIAL SPECIFICATIONS
   A. Bronze - 150 psi maximum: ASTM B62
   B. Bronze - 300 psi maximum: ASTM B61
   C. Cast Iron: ASTM A126, Class B
   D. Cast Carbon Steel: ASTM A216, Grade WCB
   E. Forged Carbon Steel: ASTM A105, Grade II
   F. Brass - Lead free, dezincification resistant arsenical brass, 125 psi maximum, ASTM 763

2.2 CONSTRUCTION
   A. Provide valves designed for repacking under pressure when fully opened.
   B. Equip with packing suitable for intended service.
   C. Furnish with gland followers.
   D. Provide valves rated greater than the design temperature and pressure for the intended system.
   E. All domestic cold water and hot water valves 2" and less shall be full port ball valves.

PART 3 EXECUTION

3.1 INSTALLATION
   A. Install valves and stops in accessible locations.
   B. Provide where shown or as required to make system complete and readily maintained.
   C. Provide access doors for all inaccessible valves.
   D. Provide as built drawings locating all valves in gas and water lines.

END OF SECTION
SECTION 22 05 30

PIPE AND PIPE FITTINGS - GENERAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

A. Pipe
B. Pipe fittings

1.3 RELATED SECTIONS

A. Section 22 00 10 - Basic Plumbing Requirements
B. Section 22 05 24 - Valves - General
C. Section 22 07 20 - Piping Insulation
D. Section 22 11 17 - Domestic Water Piping and Appurtenances
E. Section 22 13 17 - Soil, Waste, and Sanitary Drain Piping, Vent Piping, and Appurtenances
F. Section 22 40 01 - Plumbing Fixtures and Fixture Carriers

1.4 REFERENCES

ASME American Society of Mechanical Engineers
UL Underwriters Laboratory
NFPA 90 A & B Installation of Air Conditioning & Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems
CISPI-310 Cast Iron Soil Pipe Institute

1.5 QUALITY ASSURANCE

A. Valves:
   1. All valves to be from a single manufacturer.

B. The welder, employed on this project, shall have passed qualification tests as prescribed by the National Pipe Welding Bureau, or other reputable testing laboratory using qualification procedures as recommended by the ASME Boiler Construction Code or the American Welding Society Standards.
1.6 SUBMITTALS

A. Provide submittal data on all items specified in this section in accordance with Specification Section 22 00 10, General Conditions, and Division 01.

B. Submit product data indicating dimensions, general assembly and use.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. The type of pipe and fittings necessary for each system is specified in the section on that system.

2.2 DISSIMILAR MATERIALS

A. Use approved adapters such as Di-Electric Unions manufactured for making piping connections between dissimilar materials such as copper and brass or copper and steel.

2.3 ESCUTCHEONS

A. Usage:
   1. All exposed lines passing through floors, walls and ceilings.

B. Material:
   1. Chrome plated steel

C. Flange size:
   1. As necessary to cover penetrated openings.

D. Plate size:
   1. As necessary to fit pipe or insulation and securely lock in place.

E. Manufacturer/Model:
   1. Engineered Brass Company, Type CF

2.4 SLEEVES

A. Application:
   1. Provide sleeves for all pipes and conduits which pass through a concrete slab, masonry wall/concrete wall, roof or other portion of the building structure.

B. Above Grade and/or dry locations:
   1. Material:
      a. 20 or 22 gauge galvanized steel.
   2. Size:
      a. As necessary to allow free passage of the insulated pipe.

C. Below Grade and/or moist locations:
   1. Material:
      a. ASTM D-2665 Schedule 40 PVC. When PVC not allowed by code, use schedule 40 galvanized steel.
      b. Return Air Plenum:
         (1) Schedule 40 galvanized steel.
D. Passing through fire-rated enclosures:
   1. Material:
      a. Galvanized or black steel pipe.
      b. Non-combustible.
      c. PVC will not be allowed.

E. Penetration Seal:
   1. Seal penetration with Fiberfrax Fyre putty or one-component ceramic fiber-based putty fill, void or cavity material, UL rated material classified for use in through-penetration firestop systems nos. 124, 125, 150 and 151.
   2. Flame Spread/Smoke Contribution:
      a. 0/0 in accordance with ASTM E-84.

2.5 VALVES, UNIONS, STOP COCKS, ETC.

A. Applications:
   1. Ball Valves:
      a. Provide accessible valves at each group of plumbing fixtures and at each piece of equipment on all piping systems for isolation of fixtures and equipment. All valves shall be full port valves.

B. All Other Valves, Unions, Stop Cocks, Etc.:
   1. Provide at each group of plumbing fixtures and at each individual fixture, at each piece of equipment, at all inlet and outlet connections for hot and cold water and gas.
   2. Provide Di-Electric Unions at connection of dissimilar pipe materials to prevent electrolysis.

C. Type:
   1. Suitable for 125 lbs. working pressure.

2.6 PIPE SUPPORTS

A. Hangers:
   1. 2" and Smaller Piping:
      a. May be split cast ring type with fastening device in walls and chases.
   2. Copper Piping:
      a. Copper plated ferrous hangers.
   3. All Other Above Ceiling Locations:
      a. Adjustable clevis type. Hangers to accommodate circumference of pipe and saddles.

B. Hanger Rods:
   1. Type:

C. Minimum Steel Hanger Rod Diameter for Individually Suspended Horizontal Pipes:
   1. 2" and smaller diameter pipe:
      a. 3/8"
   2. 2-1/2" to 3 - 1/2" diameter pipe:
      a. 1/2"
   3. 4" to 5" diameter pipe:
      a. 5/8"
   4. 6" diameter pipe or larger:
      a. 3/4"

D. Hanger Manufacturers:
   1. Anvil
PART 3 EXECUTION

3.1 PIPE INSTALLATION

A. Install piping in a neat and workmanlike manner.

B. Install each of the piping systems to provide for expansion and contraction.

C. Solder all joints when the system is not under strain.

D. Expansion Offsets:
   1. Copper Piping:
      a. Use developed length Copper Tube Handbook 411-R as published by Copper Development Association, Inc.
   2. Steel Piping:
      a. Use developed per Carrier System Design Manual, Part 3 Piping Design.

E. Furnish necessary spring pieces and offsets as required.

F. Conceal all of the piping systems in chases, above ceilings, in walls and in finished areas.

G. Run Exposed piping only in machinery spaces and unfinished areas as specified or as shown on the plans.

H. Install all necessary fittings and offsets to hold the piping close to walls and ceilings.

I. Where these lines run exposed, obtain a clearance from the Engineer in writing before making the installation.

J. Install piping in the most advantageous manner possible with respect to headroom, valve access, openings, equipment clearances, and clearances for other work.

K. Give particular attention to piping in the vicinity of equipment.

L. Preserve the maximum access to various equipment parts for maintenance.

M. Do not cut or weaken any structural member.

N. Cut all pipes accurately to measurement determined at the site.

O. After cutting pipe, ream it to remove burrs.
P. Install piping neatly, free from unnecessary traps and pockets. Work into place without springing or forcing.

Q. Use fittings to make all changes in direction.

R. Field bending and mitering are prohibited.

S. Make all connections to equipment using flanged joints or unions.

T. Make reducing connections with reducing fittings only.

U. Do not allow piping to pass through or over designated electrical rooms.

V. Compression fittings are not allowed.

3.2 VALVES, UNIONS, STOP COCKS, ETC.

A. Locate all valves so that their bonnets may be easily removed.

B. Move all flange valves shown in horizontal positions so that valve stem is inclined one bolt hole above the horizontal position.

C. Make-up all screwed pattern valves placed in horizontal lines so that their valve stem is inclined at an angle of 30 degrees above the horizontal position.

D. All valve stems must be true and straight at the time the system is tested for final acceptance.

E. Pack all valves and leave perfectly tight at the completion of the work.

F. Provide access doors as required for these valves.

G. Furnish locations of all access doors to the Architect/Engineer.

3.3 PIPING JOINTS

A. Screwed Pipe Joints:
   1. Provide full cut pipe threads.
   2. Assemble joints with an approved compound applied to only the male threads.
   3. Leave a maximum of three pipe threads exposed where the joint is assembled.

B. Welded Pipe Joints:
   1. Fuse weld by using a metallic arc welding process.
   2. Conform to the current recommendations of the American Welding Society for all welding operations.

C. Mechanical Coupling Joints:
   1. Assemble in strict accordance with the recommendations of the coupling joint manufacturer.
   2. Use bolts, fasteners, gaskets and lubricants that are a product of or adhere rigidly to the specification requirements of the joint manufacturer.

D. Solder Joints:
   1. Assemble with square cut pipe using a pipe cutter.
   2. Hacksaw-cut pipe ends will not be acceptable.
   3. Ream open pipe end to full size.
   4. Burnish both the pipe and fitting absolutely clean.
5. Apply brazing flux to both the pipe and the fittings.
6. The use of corrosive acid flux will not be permitted.
7. Charge the pipe and fittings with nitrogen gas during the brazing.

E. PVC Pipe Joints:
1. May be solvent cemented using the proper cement recommended for the particular materials.
2. Cut all pipe square and clean both pipe and fittings of all soil, dirt, oil and grease.
3. Make solvent joints in accordance with the applicable ASTM Standards.
4. Allow joints to dry before testing.
5. If any leak occurs during the water test, then replace the defective joint.
6. Comply with requirements of the NSF Standard 14 for all solvent cements and primers and label to identify the laboratory certifying compliance for the particular cement and primer being used.
7. Plastic pipe and fittings for sewer and water pressure lines may also be joined by use of elastomeric (O-ring gasket) joints when the respective standards for the materials so specify. No-Hub fittings are not allowed on PVC sanitary sewer and storm drain piping under slab or underground.
8. Do not use pipes with cracked bells.

3.4 SLEEVES

A. Above Grade and/or Dry Locations:
1. Walls:
   a. Mount flush on both sides.
2. Floors:
   a. Mount 2 inches above finished floor in pipe chases.

B. Below Grade and/or Moist Locations:
1. Install suitable flange in the center of wall or floor to form a waterproof passage.
2. Fill the void space around the pipe with jute twine or Oakum caulk or an asphalt based compound to insure a waterproof penetration.

C. Passing Through Fire-Rated Enclosure:
1. Fill the void space around the pipe in accordance with NFPA requirements.
2. Do not allow the sleeve installation to lower the fire rating of the assembly.

3.5 SECURING AND SUPPORTING OF PIPE

A. Support all pipe from the building structure by means of approved hangers and supports while maintaining required grade and pitch, preventing vibration and providing for expansion and contraction.

B. Secure all hangers to approved inserts wherever possible.

C. Set hanger inserts in place when the concrete is poured.

D. If Joists Are Used for Attachment:
1. 2" diameter or smaller:
   a. May be attached to the bottom of joists.
2. Greater than 2" diameter:
   a. Must be attached to the top cord of the joists.
3. Do not support any piping and trapeze hangers from joist bridging on roof and floor deck.
E. If Structural Steel Framing Is Used for Attachment:
   1. Use approved beam clamps.
   2. Where required, install channels to span between framing members.
   3. Do not attach hangers to the roof deck or cross bracing.

F. Hanger Spacing:
   1. Schedule 40 PVC Piping:
      a. All Sizes:
         (1) 4' 0"
   2. Ferrous (Schedule 40) Piping:
      1. 1/2" diameter pipe:
         a. 6' 0" or less
      2. 3/4" diameter pipe:
         a. 8' 0" or less
      3. 1-1/4" diameter pipe:
         a. 10' 0" or less
   4. Vertical:
      a. Every Floor Level Minimum
   5. Copper (Water Tube) Piping:
      1. Smaller Than 1 1/4":
         a. 6' 0"
      2. 1 1/2" and Larger:
         a. 10' 0"
   6. Vertical:
      a. 10' 0"

I. Vertical Lines:
   1. Adequately support at their bases, either by a suitable hanger placed in the horizontal line near the riser, or by a base fitting set on a pedestal or foundation.
   2. Support from each floor slab by means of an approved clamp-type support which bears on the slab or beam.

J. Change of Direction:
   1. Install supports within two feet of change of direction.
   2. Brackets of approved type may be used along the walls.
   3. Install hangers within 2 feet of each change in vertical or horizontal direction, pipe tees and on each side of valves, strainers, etc.
   4. Multiple horizontal pipes, smaller than 12" diameter pipe, may be supported on trapeze hangers. Space trapeze hangers in accordance with the schedule for pipe spacing based upon the smallest size pipe.
   5. Properly size the trapeze members for the piping load they are to support. The number of pipes on the trapeze must be approved by the Engineer to prevent overloading of the building structure.
   6. Where pipes are insulated, oversize the hanger accordingly to accommodate the outside diameter of the insulation. Provide half-round 16 gauge galvanized steel shields, not less than 12" long and rolled to fit the insulation diameter, between the insulation and the hanger.
   7. When pipe is guided at top and bottom, cover the entire pipe circumference with metal shields.
   8. Adhere metal shield to the insulation so that the metal will not slide with respect to the insulation.
   9. Wood struts shall not be used to support piping in walls.
3.6 EXCAVATION AND BACKFILLING

A. Excavation:
   1. Call utility companies before digging.
   2. Call Notifications Center before digging.
   3. Excavate trenches for underground piping to the required depths with bell holes being provided as necessary to insure uniform bearing. Dig all bell holes after the trench has been graded.
   4. Refill excavation below the required grade of piping with fine granular material to the pipe grade.
   5. Where rock is encountered, excavate to a grade 3 inches below the lowermost part of the pipe and refill with fine granular materials to the pipe grade.
   6. Sheath, brace, pump or bail the trenches as required to protect workmen and structures and to permit execution of the work. A trench greater than 5 feet deep will not be permitted unless the sides are cutback at 45 degrees to 5 feet or less. If this cannot be accomplished, hire a Registered Engineer to design shoring.
   7. Install all underground piping below the frost line and in no case less than 18 inches below the surface.

B. Sand Embedment Backfill:
   1. Sand for embedment shall be a free flowing material which contains no clay, is reasonably free from organic material and does not form a muck or mud when wet. The gradation shall be such that a minimum of 95% is retained on a #100 sieve. The P.I. of the soil fraction passing the No. 40 sieve shall not be greater than 5.

C. Backfilling:
   1. Do not backfill until after all required tests have been performed and approved.
   2. Perform all backfilling with approved materials well compacted in place in accordance with the General Specifications including Division 02.

D. Rigid Pipe (Ductile Iron):
   1. Backfill with select materials of the proper moisture content to obtain a support under the lower half of the pipe.
   2. Compact to a density of 90% AASHTO T-180 modified or better.

E. Non-Rigid Pipe (PVC):
   1. Backfill as specified for rigid pipe except backfill the entire trench surrounding the pipe barrel to a point 12 inches above the top of the pipe with select material compacted to a density of 90% AASHTO T-180 modified or better.
   2. Lay backfill according to manufacturer’s recommendations.

F. Job Photographs:
   1. Contractor is to provide digital photographs of all pipe showing sand embedment prior to covering trenches.

3.7 EQUIPMENT PLUMBING CONNECTIONS

A. Make all final connections to all pieces of equipment which require natural gas, water, drain, waste or vent connections.

B. Provide all required shut-off cocks, valves, drain valves and traps.
3.8 TESTING AND INSPECTION

A. Perform all tests as specified in Division 22 or as required by the Engineer or by the Local, Federal, and State Bureaus having jurisdiction and under their supervision during the progress and upon completion of work.

B. Include costs of all required tests in your bid.

C. Provide all apparatus, temporary pipeline and all other requirements necessary for such tests.

D. Take all due precautions to prevent damage to the building or its contents incurred by such tests as the Contractor will be required to repay and make good any damage so caused at his own expense.

E. Immediately repair any leaks, defects or deficiencies discovered as a result of the tests. Repeat until test requirements are in full compliance.

3.9 IDENTIFICATION OF PIPING AND EQUIPMENT

A. Mark all piping to show the service and direction of flow.

B. Place markers at each branch of tees, at equipment connections, and change of direction and at 20 foot intervals. Minimum of one (1) marker in each room.

C. Install valve tags on all valves.

D. Frame under glass cover and hang a type written list including the valve number, type of service, and location of each valve in the boiler mechanical room.

E. Mark all valve numbers corresponding to this system of identification on the as-built drawings which will be delivered to the Owner upon completion of the work.

END OF SECTION
SECTION 22 05 54
PLUMBING IDENTIFICATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

A. Identification required for plumbing systems.
B. Code required identification not shown on plans nor specified herein shall be provided.

1.3 RELATED SECTIONS

A. Section 22 00 10 - Basic Plumbing Requirements
B. Section 22 05 30 - Pipe and Pipe Fittings - General

1.4 SUBMITTALS

A. Provide submittal data on all items specified in this section in accordance with Specification Section 22 00 10, General Conditions, and Division 01.
B. Submit wording of nameplates with submittals.
C. Submit list of all products incorporated in this section.

1.5 REFERENCES

A. Comply with ANSI A13.1
B. USAS Code B31.8
C. NTSB-PSS-73-1
D. AGA
E. API

1.6 DESCRIPTION OF WORK

A. Provide signs for the following equipment identification:
   1. Piping
   2. Valves

PART 2 PRODUCTS
2.1 MANUFACTURERS

A. Seton

B. Brady

2.2 EQUIPMENT LABELS

A. Type:
   1. Engraving-Stock, melamine plastic laminate, 3 layer.
      a. Thickness:
         (1) Less than 25 square inches: 1/16 inch
         (2) 25 square inches or more: 1/8 inch

B. Color:
   1. Black

C. Conform to FS L-P-287

2.3 LETTERING

A. Style:
   1. Engraved standard print, unless otherwise indicated.

B. Size:
   1. 3/16 inch to 1/4 inch

C. Color:
   1. White letters, black background

2.4 SIGN INFORMATION

A. Plumbing Equipment:
   1. Unit mark from Drawings/Owner
   2. Voltage - Phase
   3. Manufacturer and Model Number

2.5 NAMEPLATE FASTENERS

A. Securely attach nameplates to equipment with non-corroding stainless steel screws.

B. Non-corroding pop rivets are acceptable.

C. Stick-ons or adhesives will not be allowed.

2.6 PIPING AND CONTROL DIAGRAM SIGNS

A. Material:
   1. 1/4 inch acrylic cover and backing screwed together with brass screw/bolts.
   2. Size:
      a. Minimum:
         (1) 12" x 17"
      b. Maximum:
         (1) 24" x 36"
B. Provide a diagram in each mechanical room similar to the diagrams shown on the plans, and/or as required for the area served.

C. Provide pipe markers with the following features.
   1. Letters from 1/2" to 3-1/2":
      a. Size letters to afford readability from the appropriate viewing position.
      b. Repeated and reversed words for viewing from 360° around pipe.
   2. Self-clinging, coiled markers that snap into place around pipe and do not require any other securement.
   3. Integral directional arrows.

D. Letters on Field:
   1. Identify the specific material conveyed, e.g., "Domestic Cold Water", "Domestic Hot Water", etc.

E. Model:
   1. Less than 3/4":
      a. Tags, same as Paragraph. Piping System Devices, color codes for hazard.
   2. 3/4" up to 6":
      a. Seton Setmark SNA snap-on.
   3. Over 6":
      a. Seton Setmark STR strap-on, with stainless steel spring straps.
   4. Use Seton Ultra-Mark for outdoor use.

F. Piping System Devices (Valves, Thermometers, Pressure Gages, etc., and Pipe Less Than 3/4"):
   1. Identify with the following:
      a. Tags:
         (1) Not less than 1-1/2 inch brass or aluminum tags, round, square, or octagonal.
      b. Stamp tags with minimum 1/2" high descriptive characters, 1/2" high numbers with black enamel-filled indentations.

G. Attachment:
   1. Stainless steel or solid brass jack chain; Seton JA16, or stainless steel or brass "S" hooks

H. Underground Warning Tapes:
   1. Provide materials that meet the codes or have the approvals listed below:
      d. AGA Report 72-D-56.
      e. API Report API RP 1109.
   2. Material:
      a. Plastic, continuous tape, color-coded, marked for hazard.
      b. For Non-metallic Piping System:
         (1) Aluminum foil core encased in plastic.
      c. Metallic Piping:
         (1) Plastic tape.
   3. Color:
      a. Colored (not printed color) plastic, coded for material conveyed by piping.
   4. Width:
      a. As scheduled for piping system burial depth.
   5. Legend:
      a. "Caution [System Name] Line Buried Below".
6. **Tape Colors:**

<table>
<thead>
<tr>
<th>Utility</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td>Safety Alert Orange</td>
</tr>
<tr>
<td>Water Systems</td>
<td>Safety Precaution Blue</td>
</tr>
<tr>
<td>Sewer Systems</td>
<td>Safety Green</td>
</tr>
</tbody>
</table>

7. **Model:**

I. **Underground Gas Piping:**
   1. Attach No. 18 gauge copper tracer wire to the piping and terminate above grade at each end.

J. **Pipeline Markers for Pipe Beneath Pavement and Slabs:**
   1. Minimum 2" round, square, or octagonal, same as specified in Subparagraph: Piping System Devices.
   2. Attachment:
      a. 1-1/2" screw, bolted to tag as anchor.
      b. Anchor Setting Compound: Epoxy or epoxy grout, compatible with the pavement.

**PART 3 EXECUTION**

3.1 **GENERAL**

A. Contractor shall verify room numbers with Owner/Engineer before nameplates are fabricated.

B. The following shall be permanently and clearly identified:
   1. Each valve and pump.
   2. Each valve whose service and/or duty is not immediately apparent.

3.2 **INSTALLATION**

A. Install signs on non-removable panels. Attach to equipment with pop rivets or stainless steel screws.

B. Mount in an easily visible location.

C. All labeling identification shall conform to final room numbers. Coordinate with General Contractor, Architect and Owner to secure construction room numbers.

D. Provide all additional signage required by local authority at no cost to the Owner.

E. Complete installation in accordance with ANSI A13.1 and manufacturer's installation instructions and with the Drawings. Fasten each unit securely in place with stainless steel screws.

F. **Equipment Labeling:**
   1. Install on scheduled items of equipment, including the following:
      a. Water heaters
      b. Pumps
      c. Control panels and major control components
      d. Other items of equipment
      e. Include Mark Number and descriptive name from Drawing and Specification schedules
1. Attach with corrosion resistant, stainless steel screws or pop rivets.

g. Install 1/2" diameter adhesive marker (color to be approved by Architect), and apply to T-bar below any mechanical equipment and fire dampers above lay-in ceiling.

2. Spacing:
   a. Where pipe passes through walls, floors, and other barriers.
   b. In Tunnel Vaults and Equipment Rooms:
      (1) Maximum spacing, 10 feet; closer where piping is congested, and where piping continuity is obscured from view.
   c. Piping in Tunnels:
      (1) Maximum spacing 100 feet
   d. Other Places:
      (1) Maximum spacing 50 feet

G. Piping System Color Coding:
   1. Designate for painter the following:
      a. Types of piping services
      b. Direction of flow
      c. Other information required for proper identification.

H. Surfaces to be Painted:
   1. Bare piping
   2. Insulation covering of insulated piping

I. Paint according to the following schedule:

<table>
<thead>
<tr>
<th>System</th>
<th>Pastel Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposed Domestic Cold Water</td>
<td>Blue</td>
</tr>
<tr>
<td>Waste and Vent</td>
<td>None</td>
</tr>
</tbody>
</table>

J. Piping System Devices (Valves, Thermometers, Pressure Gages, etc.):
   1. Identify with the following information:
      a. System
      b. Device number
      c. Device Function
   2. Device Chart:
      a. Key devices to device chart
      b. Give complete description of device function and system.

K. Key devices to drawings as follows:
   1. Floor plans
   2. Schematic drawings of piping systems

L. Underground Warning Tapes:
   1. Tape Widths:

<table>
<thead>
<tr>
<th>Piping Burial Depth</th>
<th>Tape Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>10&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>20&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>27&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>40&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>50&quot; or more</td>
<td>18&quot;</td>
</tr>
</tbody>
</table>
M. Recommended Tape Bury Depth:
   1. Minimum Depth:
      a. 6”.
   2. Distance Between Pipe and Tape:
      a. Minimum 12”.
   3. Maximum Depth:
      a. 12”.

N. Tie tape to pipe where pipe leaves the ground.

O. Pipeline Markers for Pipe Beneath Pavement and Slabs.
   1. Location:
      a. Accuracy:
         (1) Plus or minus 6” from piping centerline.
      b. Flat Edge Pavement and Slabs:
         (1) Set within 6” of pavement or slab edge.
      c. Concrete Curbs:
         (1) Set in top of curb.
      d. Spacing:
         (1) Each change in direction, each edge of pavement or slab, maximum spacing of 100’.

P. Legend:
   1. Same as tags plus an engraved or stamped line; set marker with line parallel to buried line.

Q. Attachment:
   1. Drill hole for anchor bolt, full depth of bolt plus 1/2”; set full tag and bolt in epoxy, flush with pavement or slab.

END OF SECTION
SECTION 22 07 20

PIPING INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

A. Fiberglass insulation
   1. Applications:
      a. Above ground domestic cold water

1.3 RELATED SECTIONS

A. Section 22 00 10 - Basic Plumbing Requirements
B. Section 22 11 17 - Domestic Water Piping and Appurtenances
C. Section 22 13 17 - Soil, Waste, and Sanitary Drain Piping, Vent Piping, and Appurtenances

1.4 SUBMITTALS

A. Product Data:
   1. Provide submittal data on all equipment specified in this section in accordance with Section 22 00 10, General Conditions, and Division 01.
   2. Submit product data indicating typical catalog of information.
   3. Submit product data sheets indicating dimensions, general assembly, and ratings.
   4. Submit manufacturer's installation instructions and method of application.

1.5 REFERENCES

A. Refer to Section 22 00 10 for complete names of references identified in this section.

ASTM E 84 Fire and Smoke Ratings
ASTM C 547 Standard Specifications for Mineral Fiber Pipe Insulation
ASTM C 585 Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)
ASTM C 795 Standard Specifications for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
ASTM C 1136 Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
NFPA 255 Surface Burning Characteristics of Building Materials
UL 723 Composite Surface Burning Characteristics

1.6 DEFINITIONS

A. Concealed:
   1. Hidden from sight as in trenches, chases, furred spaces, walls, pipe shafts, or hung ceilings.
B. Exposed:
   1. Not "concealed" as defined above. Normally open and visible to building occupants (such as gymnasiums).

1.7 QUALITY ASSURANCE

A. Fire Hazard Rating:
   1. All insulation used on the project must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50 as determined by test procedures ASTM E84, NFPA 255 and UL 723.
   2. These ratings must be tested on the composite of insulation, jacket or facing, and adhesive.
   3. Components such as adhesives, mastics and cements must meet the same individual ratings as minimum requirements.

B. Quality Controls:
   1. All insulation shall be the product of reputable manufacturers.
   2. All insulation shall be applied by mechanics skilled in the use of various materials, and in the employ of a concern regularly engaged in the insulating business. Submit qualifications of insulator with insulation submittals.
   3. The materials shall be applied in accordance with the special materials as required by these specifications and by the manufacturer standards.
   4. Poor workmanship or appearance will be cause for rejection.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Armstrong

B. Johns Manville

C. Knauf

D. Owens/Corning

2.2 GENERAL

A. Molded pipe insulation shall be manufactured to meet ASTM C 585 and ASTM C 547 for sizes required for the particular system and shall be suitable for installation on piping systems defined.

2.3 ABOVE GROUND PIPE INSULATION

A. Density:
   1. 3/4 lb. per cubic foot.

B. Minimum R value:
   1. 4.0 per inch of thickness.

C. Construction:
   1. Fiberglass with factory-applied, all service reinforced vapor barrier jacket having integral laminated aluminum vapor barrier and double adhesive self-sealing lap.
D. Thickness:
   1. Domestic Cold Water Piping:
      - a. Interior walls and above ceilings:
         (1) 1/2 inch
      - b. Exterior walls:
         (1) 1 inch

E. Make/Model:
   1. Owens Corning ASJ/SSL-II

2.4 FLANGE, VALVE AND FITTING INSULATION

A. Exposed Piping:
   1. Provide molded or mitered covers with full thickness matching adjacent covering.
   2. Finish with white glass, reinforced white vapor barrier coating or white .020 inch thick PVC jacketing with self-seal lap.

B. 2½ Inch Diameter and Larger Concealed Piping:
   1. Insulate fittings and valves with molded or mitered fitting covers.
   2. Finish with white vapor barrier coating reinforced with white 10" x 10" reinforced mesh.

C. 2 Inch Diameter and Smaller Concealed Piping:
   1. Insulate fittings and valves with mineral wool and insulating cement to a thickness equal to or greater than adjoining straight pipe.
   2. Molded or mitered fittings finished with white vapor barrier coating reinforced with reinforced mesh may be provided.

D. Underground Piping (hot water only):
   1. Provide mitered covers with full thickness matching adjacent covering.
   2. Field fabricated miter joints are not acceptable.
   3. No insulation is required on underground domestic cold water piping.

E. Outdoor Piping:
   1. Metal jacketing shall be 0.016" minimum aluminum or stainless steel with moisture barrier, secured in accordance with jacket manufacturer's recommendations.
   2. Use preformed fitting covers matching jacket used on straight pipe, with all joints sealed with metal jacketing sealant.

2.5 SEALANT, ADHESIVE, AND FINISH

A. Sealant:
   1. Manufacturers:
      - a. Foster 95-44
      - b. Childers CP-76
   2. Usage:
      - a. Valve Covers
      - b. Anchors
      - c. Hangers
      - d. Metal Jacketing
      - e. Flashing Penetrations

B. Adhesive:
   1. Manufacturer:
      - a. Foster 85-20/85-60 and Childers CP-127
   2. Usage:
      - a. Longitudinal laps of the vapor barrier jacket
b. Butt joint covers.

C. Weather Barrier Mastic
   1. Manufacturers:
      a. Foster 46-50
      b. Childers CP-10
   2. Usage:
      a. Used on above ambient piping/duct to protect insulation from weather.
      b. Use in conjunction with reinforcing mesh.

D. Vapor Barrier Coating:
   1. Manufacturer:
      a. Foster 30-33 Vapor Out
      b. Childers CP-33 Chil Out
   2. Usage:

E. Reinforcing Mesh
   1. Manufacturers:
      a. Foster Mast Afab
      b. Childers Chil-glass #10

2.6 INSULATION SHIELD

A. Field-fabricated:
   1. Material:
      a. High-density fiberglass insulation
   2. Construction:
      a. Insulation to support the bearing area at hangers and supports with a shield of galvanized metal extending not less than 4 inches on either side of the support bearing area, covering at least half of the pipe circumference. When pipe is guided at top and bottom, metal shields should cover the whole pipe circumference. Adhere metal shield to insulation so that metal will not slide with respect to insulation.
   3. Schedule:
      a. 3" and smaller pipe diameter:
         (1) 12 inch insulated section, 18 gauge metal shield
      b. Greater than 3" pipe diameter:
         (1) 12 inch insulated section, 16 gauge metal shield

B. Factory-made:
   1. Manufacturer:
      a. Pipe Shields, Inc. or equal.
   2. Type:
      a. Proper shield for service and pipe span.
   3. Construction:
      a. Extend insulation at least 1 inch beyond metal.

C. Insulation shall not compress at hanger.

PART 3 EXECUTION
3.1 SITE INSPECTION

A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.

B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.

C. Verify, by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments, that all materials and accessories to be installed on the project comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PROPERTIES

A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.

B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation.

C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

3.3 INSTALLATION

A. General:
   1. Install all insulation materials and accessories in accordance with manufacturer's published instruction and recognized industry practices to ensure that it will serve its intended purpose.
   2. Install insulation on piping subsequent to installation of heat tracing, painting, and acceptance tests.
   3. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit over all piping surfaces.
   4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with suitable vapor barrier coating to maintain vapor barrier integrity.

3.4 PIPE

A. Insulation size shall match pipe size.

B. Insulation to be continuous through wall and ceiling penetrations.

C. Apply insulation to clean, dry pipes.

D. Butt insulation joints firmly together and apply butt strip. All pipe insulation ends shall be tapered and sealed.

E. Butt pipe insulation against hanger inserts. Seal jacketing according to type used.
F. Seal longitudinal laps and butt strips with sealant in addition to the self-sealing laps.

G. Seal joints with adhesive and staple at 2” O.C. with outwardly clenching staples.

H. Seal all joints with vapor barrier coating.

3.5 VALVES, FLANGES, AND FITTINGS

A. Insulate all valves, flanges, and fittings with covers secured with Velcro with equivalent thickness and composition installation on straight pipes.

B. Finish with 1/4 inch layer of Foster 30-33 or Childers CP-33 reinforced with reinforcing mesh.

C. Factory made covers equal to Schuller Zeston are acceptable.

3.6 CONTROL VALVE COVERS

A. Fabricate special covers, complete with troweled-on vapor seal, shaped to accommodate the valve stem. Insulation thickness shall be same thickness as adjoining pipe.

B. Seal covers to valve insulation properly with adhesive so that the seal may be broken with a knife blade without damage to either part. Arrange so that cover can be removed and replaced as necessary for operation of the valve.

C. Finish valve cover with glass cloth and two coats of vapor barrier coating.

D. Factory made covers are acceptable. Provide submittal.

3.7 REPAIRS AND REPLACEMENT

A. Replace any insulation that gets wet, whether now dry or not.

B. Repair any damage caused by condensation due to improper insulating.

3.8 EXPOSED PIPING

A. Insulate piping exposed to view with a glass fabric or canvas jacket with brushed on coating to present a smooth finished look to a height of 8 ft. A.F.F. or use PVC cover.

3.9 OUTDOOR PIPING

A. Metal jacket shall be applied per manufacturer’s recommendations. Longitudinal joints shall be applied so they will shed water completely and be sealed completely with 1/8” bead of metal jacketing sealant under each lap. Circumferential joints shall be closed using preformed butt strips in accordance with manufacturer’s recommendations.

3.10 SHIELDS

A. Metal jacketing shall be 0.016-inch minimum aluminum or stainless steel with moisture barrier, secured in accordance with jacket manufacturer’s recommendations. Use bands and seals of the same material. Use preformed fitting covers matching jacket used on straight pipe, with all joints weather sealed with 1/8” bead of metal jacketing sealant under each lap.
3.11 SHIELDS AND HANGERS

A. Piping hangers or anchors are not be in direct contact with pipe. Hangers are to on the outside of the insulation with pipe shields at each hanger.

B. At the location of hangers or supports for pipes run above ground and finished with a vapor seal insulation, provide rigid sections of cork, high density fiberglass, Foamglas, calcium silicate or high density polyurethane, the same thickness as adjacent insulating material to adequately support the pipe without compression of the insulating material and cover with a vapor seal that is bonded to the adjacent insulation as described for fittings in the lines. Wood inserts shall not be allowed. Hangers and supports for piping insulation to receive a vapor barrier shall be installed exterior to the insulation.

C. Material Changes:
   1. Wherever there is a change in materials on lines that are vapor sealed, apply a suitable adhesive that is compatible with both materials, tapes, etc., as required to maintain the vapor barrier.

D. Apply insulation around the hanger ring or anchor and pipe and carry vapor barrier upward and outward along the hanger rod or anchor members to a point not less than 12 inches from the adjacent pipe.

E. Take care to avoid puncturing the vapor seal.

F. Finish insulation as specified for flanges, and seal over adjacent vapor barrier jacket.

3.12 FIELD QUALITY ASSURANCE

A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.13 PROTECTION

A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.

B. The insulation contractor shall advise the general and/or the mechanical/plumbing contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

END OF SECTION
SECTION 22 11 17

DOMESTIC WATER PIPING AND APPURtenances

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

A. Domestic cold water piping.

1.3 RELATED SECTIONS

A. Section 22 00 10 - Basic Plumbing Requirements
B. Section 22 05 24 - Valves - General
C. Section 22 05 30 - Pipe and Pipe Fittings - General
D. Section 22 33 34 - Access Doors
E. Section 22 40 01 - Plumbing Fixtures and Fixture Carriers

1.4 REFERENCES

A. ASTM 763 - Standard Specification for Copper Alloy Sand Castings for Valve Applications
B. ASTM 61 - Standard Specification for Steam or Valve Bronze Castings
C. ASTM C27450 - Standard Specification for Brass Rod, Bar & Shapes
E. ASTM A105 - Standard Specification for Carbon Steel Forgings for Piping Applications
F. ASTM - American Society of Testing Materials
G. ASTM B813-00e1 - Standard Specification for Liquid & Paste Fluxes for Soldering of Copper & Copper Alloy Tube
H. ASTM B828-02 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
I. ASTM B88-02 - Standard Specification for Seamless Copper Water Tube
J. PDI - Plumbing & Drainage Institute
K. NSF/ANSI Standard 61
1.5 SUBMITTALS

A. Provide submittal data on all items specified in this section in accordance with Specification Section 22 00 10, General Conditions, and Division 01.

B. Submit product data sheets.

PART 2 PRODUCTS

2.1 UNDERGROUND PIPING

A. Type:
   1. 2 Inch Diameter and Smaller:
      a. Type “L” soft drawn commercially pure copper
   2. 2½ Inch Diameter:
      a. Type “L” hard drawn commercially pure copper
   3. 3 Inch Diameter or Larger:
      a. Type “L” hard drawn commercially pure copper

B. All copper meets ASTM B88 Standards.

2.2 UNDER SLAB PIPING

A. Type:
   1. 2 Inch Diameter and Smaller:
      a. Type “K” soft drawn commercially pure copper
   2. 2½ Inch Diameter and Larger:
      a. Type “K” hard drawn commercially pure copper

B. No joints will be permitted in piping runs beneath concrete slabs. All joints shall be made in accessible areas above the slab (behind access doors in walls, in mechanical closets, etc.).

C. All copper meets ASTM B88 Standards.

2.3 INTERIOR PIPING

A. Type:
   1. Type “L” hard drawn commercially pure copper

B. All copper meets ASTM B88 Standards.

2.4 PIPE FITTINGS

A. Copper Piping:
   1. Unions:
      a. 150 lb. standard, 300 lb. water-oil-gas service copper with ground joints.

B. Dissimilar Metal:
   1. Di-Electric Unions

2.5 PIPE JOINTS

A. Copper Piping:
   1. Type: Solder fittings
      a. Solid string, hard solder
2. Type: Press-connect fittings
   a. Copper and copper alloy fittings with EPDM elastomeric sealing element.
   b. Unpressed fittings shall leak and not hold pressure.
3. Approved Manufacturers:
   a. Viega ProPress
   b. Nibco
   c. Mueller Industries Streamline PRS
4. Material:
   a. Solder (1½" and Smaller):
      (1) 95-1/2% tin, 4% copper and 1/2% silver
   b. Solder (2" and Larger):
      (1) "SILFOS15", 15% silver, 80% copper, 5% phosphorous
   c. Flux:
      (1) Non-corrosive, lead-free paste
5. Use a cast brass adapter when connecting copper pipe to screwed brass pipe.
6. Brand:
   a. Silvabrite or similar brand

B. Conform to ASTM B813 and ASTM B828.

2.6 VALVES

A. Type:
   1. Check Valves:
      a. 125 lb. bronze check valve with "Buna-N" disc.
   2. Ball Valves:
      a. 150 psi, bronze 1/4 turn ball valve with full port.
      b. 300 psi, bronze 1/4 turn ball valve with full port. ASTM 61
      c. 125 psi, lead free dezincification resistant arsenical brass ¼ turn ball valve with full port, C46500 or CW 511L, ASTM 763
   3. Temperature and Pressure Relief Valves:
      a. ASME rated valve
   4. Gate Valves:
      a. 125 lb. rising stem, double-disc bronze gate valves larger than 3 inches.
   5. Water Main Valves:
   6. Pressure Reducing Valves
      a. 300 lb. bronze sealed spring cage, strainer
   7. Cast Iron: ASTM A126, Class B
   8. Cast Carbon Steel: ASTM A216, Grade WCB
   9. Forged Carbon Steel: ASTM A105, Grade II

B. Manufacturers:
   1. Apollo
   2. Crane
   3. Grinnell
   4. Jenkins
   5. Jomar, T-100NGDZ
   6. Kennedy
   7. Milwaukee Valve Company
   8. Nibco
   9. Stockham
   10. Walworth
   11. Watts
12. Hammond

C. Provide valves where required to adequately control and isolate the various domestic water piping systems.

D. Provide valves at the connection point of all equipment.

E. Provide Di-Electric Unions at connection of dissimilar metal.

2.7 CONSTRUCTION

A. Provide valves designed for repacking under pressure when fully opened.

B. Equip with packing suitable for intended service.

C. Furnish with gland followers.

D. Provide valves rated greater than the design temperature and pressure for the intended system.

E. All domestic cold water and hot water valves 2" and less shall be full port ball valves.

2.8 WATER HAMMER ARRESTORS

A. Water Hammer Protective Devices:
   1. Usage:
      a. Provide on hot and cold water supply lines. Locate between last two flush/solenoid valves on supply lines or per manufacturer’s recommendations.
      b. In single toilets locate within 3-feet of fixture or per manufacturer’s recommendation.
   2. Type:
      a. As recommended by the manufacturer for the particular application.
      b. Locate arrestor on shop drawings with size.
   3. Manufacturer/Model:
      a. Wade "Shokstop"
      b. Sioux Chief “Hydra-Rester”
      c. PPP “SC Series”
      d. Mifab “MWH Series”

2.9 FREEZE PROTECTION

A. Heat Trace Tape:
   1. Usage:
      a. Provide on hot and cold water supply lines where freezing of the piping is a concern.
   2. Type:
      a. Self-regulating heating cable, 5 watt per liner foot. Provide control panel and all necessary controls and wiring.
   3. Manufacturer/Model:
      a. Raychem XL-Trace

PART 3 EXECUTION

3.1 INSTALLATION

A. All products to comply with NSF/ANSI Standard 61.
B. Install in accordance with the plans and Section 22 05 30.

C. Drainage:
   1. Minimum Slope:
      a. 1/8 inch per 10 feet.
   2. Where constant pitch cannot be maintained for long runs, establish intermediate low points and rise to higher level.
   3. Slope branches to drain toward mains or risers.
   4. Terminate low points of risers with drain valve piped to nearest hub or floor drain unless otherwise indicated.

D. Water Hammer Arrestors:
   1. Install in accordance with PDI Standard WH201.

3.2 VALVES

A. All valves, trap primers, etc. that are located behind access doors shall be located directly behind door and within 24" of plane of door.

3.3 INSTALLATION

A. Install valves and stops in accessible locations.

B. Provide where shown or as required to make system complete and readily maintained.

C. Provide pressure reducing valve on domestic water main where hydrostatic pressure exceeds 80 psi.

D. Isolation valves shall be located:
   1. Restroom Gang – Behind an 18" x 18" stainless steel access panel with screwdriver operated latch located in the Boy’s or Men’s restroom.
   2. Individual (private) Restrooms – Behind an 18" x 18" stainless steel access panel with screwdriver operated latch.
   3. Individual Fixtures – Above the ceiling within 12" of the water risers where ceiling is accessible. Above the ceiling behind ceiling access panel within 12" of the water riser where ceiling is not accessible.
   4. Isolation valves on the domestic cold water shall be provided in corridors to allow isolation of buildings wings, sections, areas.

E. Press fitting manufacturer shall provide a duplicate set of all tools required to maintain and/or modify press fittings. Required tools are to be given to the owner. One set of tools shall be provided for each campus.

3.4 FIELD QUALITY CONTROL

A. Properly test water distribution systems with hydrostatic pressure in accordance with local plumbing code.

B. Do not install trap primers, flush valves or other pressure sensitive devices until all tests are completed.

C. Repair all leaks in pipes, fittings and accessories during this test period.

D. Repeat hydrostatic test until no leaks are found for an entire 8 hour period.
E. Make joints in accordance with ASTM B828.

3.5 STERILIZATION

A. Solution:
   1. Strength:
      a. Minimum 50 parts per million
   2. Agents:
      a. Liquid Chlorine:
         (1) Conform to U.S. Army Specification #4-1
      b. Calcium Hydrochloride:
         (1) Federal Specification O-C-114
      c. Chlorinated Lime:
         (1) Federal Specification O-C-114

B. Procedure:
   1. Perform sterilization after testing has been satisfactorily completed.
   2. Pump solution into a 1/4 inch opening provided in the water main next to the water meter.
   3. Conduct the sterilization process under the direction of the local health department.
   4. After sterilization, flush the system with clean water until the residual chlorine content is less than 3 ppm.
   5. After flushing, the local health department will test and verify the cleanliness of the system.

3.6 PLUMBING SCHEDULE

A. Minimum Size:
   1. Sinks:
      a. 1/2" cold water, 1/2" hot water
   2. Hose Bibbs:
      a. 3/4" cold water

END OF SECTION
SECTION 22 13 17

SOIL, WASTE AND SANITARY DRAIN PIPING, VENT PIPING, AND APPUR TENANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

A. Drain and vent piping within the building and underground laterals.

1.3 RELATED SECTIONS

A. Section 22 00 10 - Basic Plumbing Requirements
B. Section 22 11 17 - Domestic Water Piping and Appurtenances
C. Section 22 33 34 - Access Doors
D. Section 22 40 01 - Plumbing Fixtures and Fixture Carriers

1.4 REFERENCES

A. Refer to Section 22 00 10 for complete names of references identified in this section.

Commercial Standard CS-188-59

1.5 SUBMITTALS

A. Provide submittal data on all items specified in this section in accordance with Specification Section 22 00 10, General Conditions, and Division 01.

B. Submit product data on pipe, pipe fittings, trap primers, covers, cleanouts, etc.

PART 2 PRODUCTS

2.1 DRAIN PIPE AND FITTINGS

A. Material:
   1. Schedule 40 PVC pipe and fittings conform to ASTM D-2665.
   2. “Foam Core PVC” not allowed.
2.2 VENT PIPE AND FITTINGS

A. Material:
   1. Schedule 40 PVC pipe and fittings conform to ASTM D-2665.

B. Comply with ASTM A74 and ASTM C564.

2.3 CLEANOUTS

A. Size:
   1. Identical with the line size up to a maximum diameter of 4 inches.

B. Type:
   1. Compatible with the surrounding floor/wall.

C. Manufacturer:
   1. Jay R. Smith
   2. Josam
   3. Mifab
   4. Sioux Chief
   5. Wade W-6000
   6. Zurn

2.4 PLUGS

A. Wade 8590, Tapped brass cleanout plug only. PVC plugs not allowed.

B. Applications:
   1. Each change in direction of soil lines
   2. End of each continuous waste line
   3. Foot of each riser within the building
   4. 50 ft. intervals in interior horizontal lines

C. Construction: Secure covers with vandal-proof screws

D. Finished Floors:
   1. Covers: Chromium plated, flush mounted, cast bronze with scoriated top surface.

E. Walls/Painted Surfaces:
   1. Covers:
      a. Furnish chromium plated covers.

F. Exterior Locations:
   1. Traffic Areas:
      a. Covers: Flush mounted, cast bronze covers with scoriated top surface
   2. Non-Traffic Areas:
      a. Encase in a 14” x 14” x 6” concrete pad
      b. Manufacturer/Model:
         (1) Wade W-8500 series

2.5 CLOSET FLANGE

A. Size: 4” to match sanitary sewer piping.

B. Type:
   1. PVC or cast iron to match sanitary sewer piping.
2. PVC flanges to be provided with stainless steel ring for reinforcement.
3. Offset toilet flanges are not allowed.

C. Manufacturer
   1. Oatley or equal

2.6 TRAP GUARDS

A. Trap guards manufactured by Proset are to be installed at all floor drains, floor sinks (Series TG).

2.7 TRAP PRIMERS - AUTOMATIC

A. Type:
   1. Fully automatic valve with diaphragm operated piston.

B. Size:
   1. Inlet:
      a. 1/2 inch
   2. Outlet:
      a. 1/2 inch

C. Features:
   1. Activated by a pressure drop.
   2. No adjustment required.
   3. Equipped with distribution unit for 1 to 4 traps.
   4. Can be located anywhere in an active cold water line of 1½ inch or less that is directly serving one or more flush valves.
   5. Provide copper tubing from trap primer to protected trap.

D. Application:
   1. Provide automatic trap primers at all floor drains and floor sinks on entire project that are within 20 feet of a water closet supply line.

E. Manufacturer/Model:
   1. Precision Plumbing Products, Inc. PO-500.

F. Furnished with AG-500 air gap fitting with alignment legs.

G. Type:

H. Size:
   1. Inlet:
      a. 1/2 inch
   2. Outlet:
      a. 1/2 inch each

I. Features:
   1. Solenoid valve set to open for 10 seconds every 24 hours.
   2. UL listed
   3. Equipped with distribution unit for 1 to 4 traps.
J. Application:
   1. Provide electronic trap primers at all floor drains, shower drains, and floor sinks on entire
      project that are not within 30 feet of a water closet supply line/flush valve. Coordinate with
      electrical contractor for required power.

2.8 SAND BACKFILL/EMBEDMENT

A. Sand for embedment shall be a free flowing material which contains no clay, is reasonably
   free from organic material and does not form a muck or mud when wet. The gradation shall
   be such that a minimum of 95% is retained on a #100 sieve. The P.I. of the soil fraction passing
   the No. 40 sieve shall not be greater than 5.

PART 3 EXECUTION

3.1 INSTALLATION

A. Location:
   1. Install a 12-gauge copper tracer wire on all underground sewers outside of building.

B. Slope:
   1. Desired: 1/4 inch per foot
   2. Minimum:
      a. 1/8 inch per foot for diameter of 4 inch and larger if approved by local authority and
         it is impractical to use 1/4 inch per foot.

C. Drain Pipe and Fittings:
   1. Reduction fittings:
      a. Use to connect two pipes of different diameter.
   2. Directional changes:
      a. Use 45 degree wyes, long sweep quarter bends, and sixth, eighth, and sixteenth
         bends. Sanitary tees may be used on vertical stacks. Use long sweeps at the base
         of risers.
      b. Embed pipe on sand cushion approximately 2 pipe diameters below (minimum 4")
         and at least one diameter on each side and top in trench.
      c. No hub couplings of any type cannot be used underground.

D. Traps:
   1. Provide at each fixture unless a trap is built into the fixture.
   2. Provide a deep seal trap and trap primers at each floor drain and hub drain.
   3. Place traps so that the discharge from any fixture will pass through only one trap before
      reaching a building drain.
   4. Place each trap as near to the fixture as possible. Do not exceed the distances stated in
      the governing codes up to a maximum of 8 feet.

E. Trap Guards:
   1. Install per manufacturer’s recommendations.

F. Hub Drains:
   1. Install with the top of the hub 1/2 inch above the finished floor, unless otherwise shown
      on the drawings.

G. Cleanouts:
   1. Install so that they open in a direction opposite to the pipe flow or at a right angle.
   2. At all wall cleanouts install tapped brass cleanout plug behind wall escutcheons.
   3. Install vertically above the flow line of the pipe for "wye" branch and end-of-line cleanouts.
4. Place cleanouts above the floors in pipe chases so that they will be accessible through doors or bring through a wall and provide with flush covers.

5. Set cleanouts flush in floor slabs.

6. Place cleanouts in accessible locations. Exact locations of each shall be approved by the Architect before installation. Locate all cleanouts within 2-feet of access door or cover.

H. Plugs:
1. Install temporary plugs in all open sanitary drain pipes during construction to prevent any foreign objects from entering the pipe.
2. All floor drains to have plugs until substantial completion.

I. Vent Piping:
1. Connections:
   a. Connect two or more vents together and extend as one vent through the roof, where practical.
   b. Make vent and waste connections to stacks by using 45 degree wyes, long sweep quarter bends, sixth, eighth, or sixteenth bends. Sanitary tees may be used on the vertical stacks.
2. Flashing:
   a. Use minimum 10-inch square, 4-pound lead flashing.
   b. Flange the flashing to the lead sleeve.
   c. Extend the flashing up and around the vent pipe.
   d. Turn the flashing down inside the pipe at least 2 inches to make an absolutely watertight joint.
   e. For single-ply rooftop systems, flash according to the roofing specifications.
3. Location:
   a. Do not locate any vent within 15 feet of an outside air intake.

4. Mop Sinks:
   a. Mop sinks to be installed after substantial completion.

5. Termination:
   a. 12 inch above roof deck or 2 inch above parapet, whichever is greater.

3.2 TESTING

A. Temporarily plug sanitary drain piping.

B. Fill the pipes with water.

C. Test the system in sections so that no section has a pressure less than 10 feet of water.

D. If the level of water has been decreased by leakage after a 24-hour period, then locate and repair all leaks.

E. Repeat the test until there is no perceptible decrease in the water level over a 24-hour period.

F. Sewer Pressurization Test:
1. Provide smoke pressure test after slab/floor is poured and again at substantial completion.
2. All smoke test on the sanitary sewer system is to be performed before ceiling tiles are installed, no exception.
3. After all water tests are complete, perform smoke test to ensure there are no air leaks in building. Fill all p-traps with water and temporarily cap all vents prior to testing.
4. Procedure for Plumbing Sewer Pressurization Test Using a Visual Smoke Indicator:
   a. Contact your local city water department, some cities may provide and supervise a smoke test for your facility.
Soil, Waste & Sanitary Drain Piping, Vent Piping & Appurtenances 22 13 17 - 6
EMA Engineering & Consulting

Amy Parks Heath Elementary Outdoor Learning Center
Heath, Texas

b. Prior to the test, notify the local fire and police departments that you are conducting a smoke test of the facility.
c. Prior to the test, turn off the fire alarms. The smoke will activate the alarm. After the test is complete the building will have to be ventilated to clear smoke and then the alarm can be reactivated.
d. You are required to have a blower with an adjustable pressure control and liquid smoke or white smoke bombs.
e. Inflatable ball stops are required to block off the sewer line at the building manhole that connects to the city sewer main line.
f. All sewer vents on the facility have to be sealed to properly conduct the test. (Duct tape over the openings is acceptable.)
g. Ladders, portable lights, two-way radio communication and standard hand tools are required for access above ceilings, floor drains, etc.
h. A minimum of three helpers are required to conduct the test.
i. Prior to the test, identify rooms or problem areas that should be observed first. Plumbing drawings are required to identify the locations of vents, traps, restrooms, etc.
j. This test will pressurize the sewer piping (approximately 1.25” S.P.) and identify any deficiencies.
k. If there are questions, contact EMA: Phone 903-581-2677.

5. Provide TV video of all main sanitary sewers in building and to city main. Notify Owner's representative when video is to be made 48 hours prior to work.

G. Job Photographs:
   1. Contractor is to provide digital photographs of all pipe showing sand embedment prior to covering trenches.

3.3 PLUMBING BRANCH SCHEDULES

A. Minimum size:
   1. Sinks:
      a. 2" waste, 1-1/2" vent

END OF SECTION
SECTION 22 33 34
ACCESS DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES
A. Access doors

1.3 RELATED SECTIONS
A. Section 22 00 10 - Basic Plumbing Requirements
B. Section 22 05 24 - Valves - General
C. Section 22 11 17 - Domestic Water Piping and Appurtenances
D. Section 22 13 17 - Soil, Waste, and Sanitary Drain Piping, Vent Piping, and Appurtenances
E. Section 22 40 01 - Plumbing Fixtures and Fixture Carriers

1.4 SUBMITTALS
A. Provide submittal data on all items specified in this section in accordance with Specification Section 22 00 10, General Conditions, and Division 01.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Acudor
B. Elmdor
C. Mifab

2.2 ACCESS DOORS
A. Locations requiring access doors:
   1. Concealed valves
   2. Traps
   3. Trap primers
   4. Controls
   5. Cleanouts
   7. Other equipment requiring accessibility for operation and maintenance.
B. Type:
   1. Hinged flush-type steel framed door with straps and exposed narrow border.

C. Minimum size:
   1. 18” x 18” unless otherwise indicated.
   2. 24” x 24” for equipment above hard ceilings.
   3. Conform to architectural panel pattern for acoustical ceilings.
   4. Confirm size with Building Inspector and Engineer.

D. Construction:
   1. Hinges:
      a. Concealed continuous type.
   2. Locking Device:
      a. Flush cam type, screw driver operated.

E. Fire Rating:
   1. Same or better fire rating than the surrounding area.

F. Access doors located in kitchens, restrooms or areas where water is present shall be stainless steel.

2.3 FACTORY PAINTING

A. Apply prime coat of rust inhibiting paint, unless located in wet area.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.

B. In suspended acoustical ceilings, provide a beaded pin or other approved means for identification and easy removal where necessary.

C. Access doors shall only be installed in areas/locations that are readily accessible.

D. Doors shall be installed in such a manner that door will open 180 degrees.

END OF SECTION
SECTION 22 40 01

PLUMBING FIXTURES AND FIXTURE CARRIERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

A. ADA Accessories
B. Sinks
C. Thermostatic Mixing Valves
D. Other Plumbing Fixtures and Equipment

1.3 RELATED SECTIONS

A. Section 22 00 10 - Basic Plumbing Requirements
B. Section 22 05 30 - Pipe and Pipe Fittings - General
C. Section 22 11 17 - Domestic Water Piping and Appurtenances
D. Section 22 13 17 - Soil, Waste, and Sanitary Drain Piping, Vent Piping, and Appurtenances
E. Section 22 33 34 - Access Doors

1.4 REFERENCES

B. PDI WH201 - Plumbing & Drainage Institute (Water Hammer Arresters)
D. AGA - American Gas Association
E. ADA - Americans With Disabilities Act
F. TAS - Texas Accessibility Standards
G. ASSE 1069 - Performance Requirements for Automatic Temperature Control Mixing Valves
H. ASSE 1070 - Water Temperature Limiting Devices
I. ASSE 1071 - Performance Requirements for Mixing Valves for Emergency Showers
1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 22 00 10, General Conditions, and Division 01.

B. Indicate on submittal construction materials, finishes, sizes, quantities, and related hardware.

C. Product Data:
   1. Plumbing fixtures
   2. Carriers
   3. Fixture trim

D. Certification:
   1. Submit certification that complete system complies with test requirements of municipality, State, and other public authorities having jurisdiction over system.

E. Provide closeout documents as required in Division 01, Section 22 00 10.

1.6 QUALITY ASSURANCE

A. Provide faucets, fittings, supply stops and similar devices of one manufacturer.

B. Verify that the voltage is the same as scheduled on the electrical drawings. If not, change at no cost to the Owner.

C. Regulatory Requirements:
   1. Comply with requirements in following order of precedence:
      a. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing, including local codes.
      b. Provisions specified in this section.
      c. Local Plumbing Code.

1.7 HANDLING

A. Deliver fixtures crated and in undamaged condition.

B. Replace damaged fixtures with new fixtures.

PART 2 PRODUCTS

2.1 GENERAL

A. All plumbing fixtures shall be new and as shown on the plans.

B. Furnish plumbing fixtures with carriers shown and all necessary trimming.

C. All porcelain enameled cast iron to be acid resistant.

D. All supplies shall be IPS brass with stops.

E. All exposed finished metal parts shall be chromium plated.

F. Rough bodied parts shall be heavily nickel plated.

G. Galvanized nipples will not be permitted.
H. Traps for lavatories, sinks, etc. shall be 17 gauge three-piece chrome plated cast brass with cleanout and IPS tailpiece and chrome plated sleeve.

I. All escutcheons on supplies and waste shall be heavy cast brass set-screw type.

J. Furnish faucets and supply stops with renewable seats.

2.2 ADA ACCESSORIES

A. P-Trap and water supplies with stop guards
   1. Usage: Each ADA lavatory
   2. Size: Verify with fixture
   3. Manufacturer/Model:
      a. Truebro Lav-Guard 102 or 105 (verify usage)
      b. Plumberex Pro Extreme #X4333 and X4114 (verify usage)

2.3 WATER HYDRANTS

A. Approved Manufacturers:
   1. Woodford
   2. Wade
   3. MAPA
   4. Mifab
   5. Josam
   6. JR Smith
   7. Zurn
   8. Prier Products

B. All frost proof water hydrants mounted in building or roof shall be designed to not require an independent drain line, unless specifically stated on construction drawings.

2.4 FAUCETS

A. Approved Manufacturers:
   1. American Standard
   2. Chicago
   3. Delta
   4. Symmons
   5. Moen
   6. T & S Brass
   7. Zurn AquaSpec
   8. Speakman

2.5 SINKS

A. Approved Manufacturers:
   1. Elkay
   2. Just

2.6 THERMOSTATIC MIXING VALVES

A. Approved Manufacturers:
   1. Acorn Controls
   2. Apollo
   3. Bradley
4. Conbraco
5. Leonard
6. Powers
7. Symmons

B. Thermostatic mixing valves for showers shall comply with ASSE 1069.

C. Thermostatic mixing valves for lavatories and sinks shall comply with ASSE 1070. Provide inlet checkstops and inlet y-strainers.

D. Thermostatic mixing valves for emergency fixtures shall comply with ASSE 1071.

PART 3 EXECUTION

3.1 PREPARATION

A. All equipment surfaces coming in contact with walls, floors, or surfaces of other fixtures shall be ground truly flat and shall be bedded with fine dental plaster.

B. Install an approved vacuum breaker or backflow preventer on each water supply line serving a plumbing fixture which has a water supply below the rim of the fixture. Vacuum breakers shall be designed to prevent any possible backflow through them. Where these are installed in chrome plated lines, they shall be chrome plated to match.

C. Temperature and pressure relief line to be piped full sized and in copper to exterior of building, or as noted on plans.

3.2 INSTALLATION

A. Furnish and completely install all fixtures shown on plans and as specified.

B. Properly anchor all fixtures, lines, or equipment to construction.

C. Clean all plumbing fixtures before final inspection and acceptance by the Architect.

D. Install all fixtures to proper heights as shown on the plans and in the codes. Refer to Texas Accessibility Standards. Coordinate height with plans. If different from engineering plans, contact the Architect for the correct height. Do not install until written approval is issued by the Architect. If fixture cannot be installed to proper height given, contact Architect for direction. No cost changes will be allowed for changes to piping to correct the problem.

E. Provide and install thermostatic mixing valves at all ADA sinks.

F. Install water heater expansion tank on cold water entering the water heater or storage tank.

3.3 FIELD QUALITY CONTROL

A. Inspect all faucets, stop valves and other equipment for proper amount of water discharged. Adjust as required to meet low water consumption and ADA/Texas Accessibility Standards.

B. Correct any faucet or other equipment as directed by the Architect/Engineer.

END OF SECTION
HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)

DIVISION 23

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 00 00</td>
<td>Basic Mechanical Requirements</td>
</tr>
<tr>
<td>23 00 90</td>
<td>HVAC Submittal Procedures</td>
</tr>
<tr>
<td>23 05 53</td>
<td>Identification For HVAC Piping And Equipment</td>
</tr>
<tr>
<td>23 34 16</td>
<td>HVAC Fans</td>
</tr>
<tr>
<td>23 82 39</td>
<td>Electric Unit Heaters</td>
</tr>
</tbody>
</table>

[Signature]

12-18-19
SECTION 23 00 00

BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, and Division 01 Specifications apply to this Section.

1.2 SECTION INCLUDES

A. Basic mechanical requirements necessary to provide complete installation of all Division 23 work.

1.3 WORK INCLUDED

A. This section of work comprises furnishing of all materials, equipment, tools, scaffolding, rigging, hoisting, labor and transportation necessary for the complete installation of the mechanical systems as shown on the plans and as specified herein.

B. Bidders shall determine the contents of a complete set of drawings and specifications and be aware that they may be bidding from a partial set of drawings, applicable only to the various separate contracts, subcontracts, or trades as may be issued for bidding purposes only. The contract documents and the complete scope of work for the project are illustrated on the combined Architectural, Structural, Plumbing, Heating, Ventilating, Air Conditioning and Electrical, and each Bidder shall thoroughly acquaint himself with all the details of the complete set of drawings and specifications before submitting his bid. All drawings and specifications form a part of the contract documents for each separate contract and shall be considered as bound therewith in the event partial sets of plans and specifications are issued for bidding only. The submission of bids shall be deemed evidence of the review and examination of all drawings, specifications, and addenda issued for this project as no allowances will be made because of unfamiliarity with any portion of the complete set of documents.

1.4 CODES & REFERENCE STANDARDS

A. General:

1. Perform all Division 23 work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are modified by the contract documents.

2. Nothing in the Contract Documents shall be construed to permit work not conforming to these codes.

3. When two or more codes or standards are applicable to the same work, then the stricter code or standard shall govern.

4. The date of the code or standard that is in effect on the date of issue of the contract documents except when a particular publication date is specified.

5. The Contractor shall be held responsible for verifying all local codes and ordinances that may alter any part of the plans or specifications. The Contractor shall bear all costs for correcting the deficiencies.

6. Where local codes and ordinances are not in writing or on record but a local precedence has been set, the Owner shall pay for any additional cost incurred.

B. Applicable Codes and Standards for All Division 23 Work:

1. International Building Code

2. International Gas Code
3. International Plumbing Code
4. International Mechanical Code
6. National Electrical Code
8. Occupational Safety and Health Administration Standards:
   a. OSHA Standard 2207 - Construction Industry Standards
   b. OSHA 29 CFR Part 1926 – Regulation of Excavation
   c. Texas Underground Facility Damage Prevention Act (H.B. 2295)
   d. All other applicable standards
9. National Fire Protection Association:
   a. NFPA No. 90A Installation of Air Conditioning and Ventilating Systems
10. Texas State Board of Insurance Standards
11. Clean Air Act and Clean Air Act Amendments
12. State Codes:
   a. Texas Department of Labor Boiler Rules and Regulations
   b. All other applicable codes
13. Local Municipal Codes and Ordinances

1.5 SCHEDULE OF ABBREVIATIONS

A. Reference Standards are listed in Section 23 using abbreviations listed below:

AABC  Associated Air Balance Council
AASHTO American Association of State Highway and Transportation Officials
ADA    Americans with Disabilities Act
ADC    Air Diffusion Council
A/E    Architect/ Engineer
AGA    American Gas Association
AMCA   Air Moving and Conditioning Association
ANSI American National Standards Institute
AHRI   Air-Conditioning and Refrigeration Institute
ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME   American Society of Mechanical Engineers
ASPE   American Society of Plumbing Engineers
ASTM  American Society for Testing and Materials
AWE    American Welding Society
AWWA  American Water Works Association
CGA    Compressed Gas Association
CISPI  Cast Iron Soil Pipe Institute
CS     Commercial Standard
CSA    Canadian Standards Association
DIPRA  Ductile Iron Pipe Research Association
DOT    Department of Transportation
DOC    Department of Commerce
FM     Factory Mutual
FS     Federal Specification
GSHPA  Ground Source Heat Pump Association
IBC    International Building Code
ITL    Independent Testing Laboratories
NEC    National Electric Code
NFPA  National Fire Protection Association
NSF    National Sanitation Foundation
OSHA  Occupational Safety and Health Administration
PDI    Plumbing and Drainage Institute
SMACNA Sheet Metal and Air Conditioning National Association
1.6 QUALITY ASSURANCE

A. Provide complete installations of all systems.

B. Furnish all items of equipment, material, and labor to complete the Contract even though each and every item necessary is not specifically mentioned or shown.

C. In case of any conflict between the specifications, plans and ordinances, the ordinances shall govern.

D. All materials furnished under this Contract shall be new, free from defects of any kind, of the quality and design hereinafter specified, and shall conform to the standards of Underwriter's Laboratories Inc., except for equipment which U.L. does not list or provide label service.

E. All mechanical equipment and fixtures shall be the same brand unless scheduled differently on plans.

F. Contractor’s Responsibility:
   1. Erect barricades, protective fencing, and signs to prevent injury to personnel on site.
   2. Make permanent connection to utilities or existing lines. Determine depth and location, and bid accordingly.
   3. Relocate and repair any existing lines cut by general construction work.
   4. Pay all costs in connection with metering devices.
   5. Plans do not show exact location and elevations of lines, nor do they show all offsets required.
   6. Deviate from plans as required to conform to the general construction and provide proper grading.
   7. Maintain all utility services during construction to existing portions of job that remain.
   8. Procure and pay for all necessary permits or licenses to carry out the work.
   9. Obtain and pay for all the necessary certificates of approval which must be delivered to the A/E before final acceptance of the work.
  10. Periodically remove rubbish, clean or repair all surfaces marred by the work required under this contract.
  11. Protect work from damage by other trades.
  12. Make all tests required by law; pay all costs in connection with the testing.
  13. Where job conditions require changes in indicated locations and arrangement, make such changes without extra cost to Owner.
  14. Provide motor starters, controls, relays, all low-voltage wiring, conduit and wiring related to HVAC and other equipment and devices to form a complete working system. See Section 26 00 00.

1.7 DEFINITIONS

A. Approval:
   1. It is understood that approval must be obtained from the A/E in writing before proceeding with the proposed work.
   2. Approval by the A/E of any changes, submitted by the Contractor will be considered as general only to aid the Contractor in expediting his work.
B. Contractor:
   1. The Contractor engaged to execute the work included in a particular section only, even though he may be technically described as a Subcontractor to the General Contractor.
   2. If the Contractor engaged to execute said work employs Sub-Contractors to perform various portions of the work included under this Section, he shall be held responsible for the execution of same, in full conformity with Contract Document requirements.
   3. The Contractor shall cooperate at all times and shall be responsible for the satisfactory cooperation of his Subcontractors with the other Contractors on the job so that all of the various phases of the work may be properly coordinated without unnecessary delays or damage to any parts of the work of any Contractor.

C. Provide:
   1. Defined as requiring the furnishing and installing of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically noted.

1.8 WARRANTY

A. The Contractor shall warranty his work against defective materials and workmanship for a period of one year from date of acceptance of the job.

B. Neither the final payment nor any provisions in Contract Documents shall relieve the Contractor of the responsibility for faulty materials or workmanship.

C. He shall remedy any defects due thereto, and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from date of substantial completion.

D. The Owner shall give notice of observed defects with reasonable promptness.

E. This Guarantee shall not be construed to include the normal maintenance of the various components of the system covered by these specifications.

1.9 SITE VISIT

A. Before submitting his proposal, each bidder shall examine all plans and specifications relating to the work, shall visit the site of the project and become fully informed of the extent and character of the work required.

B. No consideration will be granted for any alleged misunderstanding of the materials to be furnished or the amount of work to be done, it being fully understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein, or indicated on the accompanying plans or required by nature of the site of which may be fairly implied as essential to the execution and completion of any and all parts of the work.

1.10 SUBMITTALS

A. Refer to Section 23 00 90 for submittal procedures.

1.11 PROJECT RECORD DOCUMENTS

A. The Contractor shall keep a set of plans on the job, noting daily all changes made in connection with the final installation including exact dimensioned locations of all new and uncovered existing utility piping outside the building.

B. Upon submitting his request for final payment, he shall turn over to the A/E, for subsequent transmittal to the Owner, a clean, neatly marked set of reproducible plans showing "as installed" work and an electronic file with changes of materials.
C. In addition to the above, the Contractor shall accumulate during the job's progress the following data, in duplication (2 each), prepared in 3 ring binders of sufficient size, black in color, neat in appearance, and turned over to the A/E for checking and subsequent delivery to the Owner. Electronic copies of the following are also acceptable, but they must be saved to a single flash drive or external hard drive:
   1. All warranties, guarantees and manufacturer's directions on equipment and material covered by the Contract.
   2. Approved fixture brochures.
   3. Copies of approved shop drawings.
   4. Set of operating instructions. Operating instructions shall also include recommended maintenance and seasonal changeover procedures.
   5. Any and all other data and/or plans required during construction.
   6. Repair parts lists of all major items and equipment including name, address and telephone number of local supplier or agent.

D. The first page, or pages, shall have the names, addresses, and telephone numbers of the following:
   1. General Contractor and all sub-contractors.

1.12 TRAINING

A. Upon completion of the work and at a time designated by the Owner's representative, provide a formal training session for the Owner's operating personnel to include location, operation, and maintenance of all mechanical equipment and systems, some sections have further instructions.

B. Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects that will be covered. Submit the outline for review by the Owner's representative.

C. At the conclusion of the instruction, obtain the signatures of the attendees on each copy of the outline to signify that they have a proper understanding of the operation and maintenance of the system. Submit the signed outlines to the Owner's representative and Engineer as a condition of final acceptance.

1.13 PLANS AND SPECIFICATIONS

A. The plans show diagrammatically the locations of the various lines, ducts, conduits, fixtures, and equipment and the method of connecting and controlling them.

B. It is not intended to show every connection in detail and all fittings required for a complete system.

C. The systems shall include but are not limited to the items shown on the plans.

D. Exact locations of these items shall be determined by reference to the general plans and measurements of the building and in cooperation with other contractors, and in all cases, shall be subject to the approval of the A/E.

E. The A/E reserves the right to make any reasonable change in the location of any part of this work without additional cost to the Owner.

F. Contractor, subcontractor, vendors and suppliers are required to waive subrogation against Owner and Engineer.
1.14 UTILITIES, LOCATIONS, AND ELEVATIONS

A. Locations and elevations of the various utilities within the scope of this work have been obtained from the City and/or other substantially reliable sources and are offered separately from the Contract documents, as a general guide only, without guarantees as to accuracy.

B. The Contractor shall examine the site, shall verify to his own satisfaction the locations, elevations and availability of all utilities and services required, and shall adequately inform himself as to their relation to the work; the submission of bids shall be deemed evidence thereof.

C. The Contractor shall coordinate all services with the Utility Companies during construction, coordinate changes made by Utility Companies to the design of project, and coordinate with the Owner, A/E, and Utility the scheduling of any shutdowns or delays that may occur in providing service.

D. The Contractor shall verify location, conduct all necessary tests, inspections, coordinate with Owner's representatives and utilities, and check for existing underground utilities and lines before ditching.

E. The Contractor shall be responsible for repair of any cut or damaged lines or utilities he uncovers. There are lines and utilities not shown on any plans.

1.15 SUBSTITUTION OF PRODUCTS

A. Substitution of products specified herein will be considered only when a complete list of proposed alternative equipment is submitted to the Engineer in writing, supported by adequate technical and cost data. This includes a complete description of the proposed substitution, drawings, catalog cuts, performance data, test data, or any other data or information necessary for evaluation.

B. All proposed substitutions and data must be received by the Engineer no less than ten working days prior to the schedule date for opening of bids.

C. The Engineer will consider all such submittals and the A/E will issue an addendum listing items which the Engineer considers acceptable. Only such items as specified or approved as acceptable will be installed on this project.

D. Manufacturers' names are listed herein and on the plans to establish a standard of quality and design. Where a manufacturer's name is mentioned, products of other manufacturers will be acceptable, if in the opinion of the Engineer, the substitute material is of equivalent quality or better than that of the material specified.

E. The Contractor's Bid represents that the bid price is based solely upon the materials and equipment described in the Bid Documents (including addenda, if any) and that he contemplates no substitutions or extras.

F. Requests for substitution are understood to mean that the Contractor:
   1. Has personally investigated the proposed substitution and determined that it is equal or superior in all respects to that specified.
   2. Will provide the same guarantee for the substitution that he would for that specified.
   3. Will, at no cost to the Owner, replace the substitute item with the specified product if the substitute item fails to perform satisfactorily.
4. After Award of the Contract, substitutions will be considered only under one or more of the following circumstances:
   a. The substitution is required for compliance with subsequent interpretations of code or insurance requirements.
   b. The specified product is unavailable through no fault of the Contractor.
   c. The manufacturer refuses to warranty the specified products as required.
   d. Subsequent information that the specified product is unable to perform properly or to fit in the designated space.
   e. In the Engineer’s sole judgment, the substitution would be in the Owner’s best interest.

5. Revisions to the mechanical system shall be under the supervision of the Engineer at a standard hourly rate charged by the Engineer and shall be paid by the Contractor originating the changes.

1.16 PROTECTION OF EQUIPMENT AND MATERIALS

A. The Contractor shall take such precautions as may be necessary to properly protect his apparatus from damage.

B. This shall include the creation of all required temporary shelters to adequately protect any apparatus above the floor of the construction and the covering of apparatus in the completed building with tarpaulins or other protective covering.

C. Failure to comply with the above to the satisfaction of the Owner’s inspector will be sufficient cause for the rejection of the equipment in question and its complete replacement by this Contractor.

D. All apparatus shall be cribbed up from the floor or ground by the Contractor and covered with tarpaulins or other protective covering where necessary or directed.

1.17 FINAL INSPECTION

A. It shall be the duty of this Contractor to make a careful inspection trip of the entire project, assuring himself that the work on the project is ready for final acceptance before calling upon the A/E to make a final inspection.

B. To avoid delay of final acceptance of the work, the Contractor shall have all necessary bonds, warranties, receipts, affidavits, etc., called for in the various articles of these specifications, prepared and signed in advance, together with a letter of transmittal, listing each paper included, and shall deliver the same to the A/E at or before the time of said final inspection. The Contractor is cautioned to check over each bond, receipt, etc., before preparing for submission to verify that the terms check with the requirements of the specifications.

1.18 ASBESTOS

A. No asbestos or asbestos containing materials shall be permitted in this project.

1.19 CUTTING AND PATCHING

A. All Subcontractors shall notify the General Contractor sufficiently ahead of construction of any floors, walls, ceiling, roof, etc., of any openings that will be required for his work.

B. He shall see that all sleeves required for his work are set at proper times so as to avoid delay of the job.
C. All necessary cutting of walls, floors, partitions, ceilings, etc., as required for the proper installation of the work under this Contract shall be done at the Subcontractor's expense in a neat and workmanlike manner, and as approved by the A/E.

D. No joists, beams, girders or columns shall be cut by any Contractor without first obtaining written permission of the A/E.

E. Patching of openings and/or alterations shall be provided by the General Contractor.

F. All openings in firewalls and floors shall be completely sealed after installation for a completely airtight installation. Sealing material shall be non-combustible and UL approved. The installed sealing assembly shall not cause the fire rating of the penetrated structure to be decreased.

G. All openings in exterior walls shall be sealed watertight.

1.20 IDENTIFICATION

A. Refer to Section 23 05 53.

1.21 MANUFACTURER'S INSTRUCTIONS

A. All equipment and devices shall be installed in accordance with these plans and specifications, manufacturer's instructions and applicable codes.

B. Where specifications call for installation of a product to be in accordance with manufacturer's instructions and/or where manufacturer's instructions are required for installation of a product, it shall be the contractor's responsibility to obtain the necessary applicable manufacturer's instructions and install the product in accordance with the manufacturer's instructions.

C. It shall be the Contractor's responsibility to install all equipment, materials, and devices shown on the plans and as called out in these specifications even if manufacturer's instructions are absolutely unattainable.

1.22 RELATED WORK

A. Whether specifically identified or not, it is the responsibility of the Mechanical Contractor to coordinate all mechanical work with all related trades.

1.23 ELECTRICAL WIRING AND EQUIPMENT FOR MECHANICAL SYSTEMS

A. All wiring, conduit, boxes, equipment (controls, thermostats, relays, contactors, motor starters, heaters, switches) and any other control devices or equipment required to form a complete and properly operating system, shall be the responsibility of the Mechanical Contractor.

B. The Electrical Contractor shall only provide line voltage (including hook-up) to all mechanical equipment.

C. All mechanical controls and devices shall be low voltage unless otherwise noted or shown on the plans. Where line voltage controls or devices are noted, the Contractor shall provide complete wiring diagrams (approved by the Engineer) to the Electrical Contractor prior to final hook-up.

D. All electrical resistance heating elements which are scheduled to be served by three-phase electrical power shall impose an equal electrical load on all phases. Electrical resistance elements which are not balanced over all three phases are not acceptable.
E. The Mechanical and Electrical plans are based on the equipment and devices scheduled as shown on the plans or as called for in the specifications. Should any mechanical equipment or device be changed or approved from those which are shown or noted, all electrical and/or mechanical changes shall be made at the expense of the trade or contractor initiating the change with no expense to the Owner, Architect, Engineer or their representatives.

F. All wiring provided by this Contractor shall be installed in a workmanlike manner using tie wraps, labels, anchors and etc. Loose wiring is not acceptable.

G. All conduit and boxes required in all walls for control purposes (thermostats, etc.) shall be provided by electrical contractor. All conduit required in attic, clear spaces, or on roof shall be by mechanical contractor.

1.24 OPERATION PRIOR TO COMPLETION

A. When any piece of mechanical or electrical equipment is operable and the Contractor needs to operate the equipment, he may do so providing that he properly supervises the operation.

B. The warranty period shall, however, not commence until such time as the equipment is operated for the beneficial use of the Owner.

C. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install clean filter media, properly adjust and complete all punch list items before final acceptance by the Owner.

D. The date of acceptance and the start of the warranty may not be the same date.

1.25 SAFETY GUARDS

A. Contractor shall furnish and install all safety guards required. All belt driven equipment, projecting shafts and other rotating parts shall be enclosed or adequately guarded.

1.26 FLAME SPREAD PROPERTIES OF MATERIALS

A. All materials and adhesives used for air conditioning filters, acoustical lining and insulation shall conform to NFPA and UL life and flame spread properties of materials.

B. The composite classifications shall not exceed the flame spread rating and the smoke development rating as outlined by NFPA 255/ ASTM E-84 for the basic material, the finishes, adhesives, etc., specified for each system, and shall be such when completely assembled.

1.27 LEAD MATERIALS

A. No lead or lead containing materials shall be allowed in any domestic or potable water supply piping, valves, fixtures, components, equipment or any other item.

1.28 ACCESS CLEARANCE

A. Proper access to all installed equipment shall be provided. The Mechanical Contractor shall label all points of access immediately upon installation with a marker pen.

B. A minimum of 3 feet shall be maintained in front of all access points.

C. If another trade violates this space, the Mechanical Contractor shall immediately notify the General Contractor to correct this condition.
D. When equipment is installed above lay-in ceiling the Mechanical Contractor shall coordinate with the Ceiling Contractor to provide access without removing part of T-bar ceiling.

E. No speakers, lights, fire alarm equipment, etc. shall be installed in lay-in ceiling tiles where access is to be gained.

PART 2 PRODUCTS

A. Not Applicable

PART 3 EXECUTION

3.1 TESTING

A. After all mechanical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation regardless of the season the contractor shall test all HVAC equipment in both heating and cooling modes.

B. Each and every phase of the new air conditioning, heating and ventilating systems shall be operated separately, or in conjunction with the other, for a period of time, to demonstrate to the satisfaction of the A/E the ability of the equipment to meet the capacity and performance requirements while maintaining design conditions in accordance with the true intent and purpose of these specifications.

C. Previous to such performance tests, the Contractor shall have set all valves, dampers, motors, controllers, thermostats, etc., and shall have the system operating and maintaining design temperatures, humidity and air circulation throughout all areas of the building.

D. Make adjustments as required to ensure proper functioning of all systems.

E. Special tests on individual systems are specified under individual sections.

END OF SECTION
SECTION 23 00 90

HVAC SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements Division 01 Submittal Procedures and contains additional requirements applicable to Division 23 submittals.

1.2 SECTION INCLUDES

A. This section includes, but is not limited to:
   1. HVAC submittal procedures
   2. List of required Division 23 submittals to the engineer
   3. This section applies only to the Division 23 specifications. Submittals required by other specification divisions are not included here, even though the same subcontractor may be providing work under other divisions.

1.3 RELATED SECTION

A. Division 01 – Submittal Procedures

1.4 DEFINITIONS

A. Product Data: Illustrations, standard schedules, performance charts, instructions, and brochures furnished by the contractor, subcontractor, manufacturer, or supplier to illustrate materials or equipment or to illustrate some portion of the work. Provide a summary of scheduled items with all data in schedules.

B. Shop Drawings: 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.

C. Equipment/Material Submittal Package: A compilation of the product data, shop drawings, and other items as required by the specifications, submitted near the start of the work. Typically, the specifications require the initial submittal package to be submitted within a certain number of days after the work starts.

D. Quality Assurance Submittal: Items submitted before and during the execution of a particular portion of the work for the purpose of guarding against defects and deficiencies.

E. Quality Control Submittal: Items submitted at the completion of a particular portion of the work for the purpose of evaluating completed activities and elements of the work for conformance with contract requirements (e.g. start-up reports).

F. Closeout Submittals: Items submitted at or near the completion of the contract.

1.5 SUBMITTALS

A. The materials, workmanship, design, and arrangement of all work installed under this contract shall be subject to the review of the architect, engineer and owner.

B. Manufacturers: Manufacturers submitted shall be as per the acceptable manufacturers listed
in each specification section or referenced schedule. For additional manufacturers requiring
approval, reference the Substitution of Products article in Section 23 00 00.

C. Required Submittals: Refer to the Submittals article of each individual Division 23 specification
section for the required items to be submitted.

D. Contractor’s Coordination Submittals: The contractor may require his subcontractors to
provide drawings, setting diagrams, and similar information to help coordinate the project, but
such data shall remain between the contractor and his subcontractors and will not be reviewed
by the engineer.

E. Electronic Submittals: E-mail or other electronic forms of submittals from the contractor are
required. The procedures described in this section shall be as follows:
   1. The contractor shall supply one electronic copy of the submittal.
   2. The electronic files will either be e-mailed to the architect, or posted to a project
      management and information exchange web site, depending on the architect’s
      requirements. The architect and contractor can distribute copies of the files as desired.
   3. The engineer will retain an electronic copy of the submittal and all responses.

F. Coordination Correspondence: The contractor may desire to verify the acceptability of a
particular item prior to assembling the initial submittal package. The contractor may send
material directly to the engineer for comments and feedback. This communication will be
treated as normal coordination correspondence and will not be tracked or documented as a
formal submittal. The engineer may or may not respond to such correspondence. If the
engineer agrees, in writing, to the use of a particular item, then that same material shall be
included in the initial submittal package along with a copy of the correspondence.

G. Unapproved Products: If materials or equipment are installed before being reviewed by the
engineer, the contractor shall be liable for the removal and replacement of such unapproved
materials and equipment, at no additional expense to the owner. Additionally, if the removal
and replacement of rejected materials or equipment necessitates the removal and
replacement of other related materials or equipment, then the contractor shall be liable for the
removal and replacement of the related materials and equipment at no additional expense to
the owner.

H. Product Data: Where the content of manufacturer submittal literature includes data not
pertinent to the submittal, clearly indicate which portions of the contents are being submitted
for review. Catalogs, pamphlets, or other documents submitted to describe items on which
review is being requested shall be specific and identifications in catalog, pamphlets, etc., of
items submitted shall be clearly made in a contrasting ink or highlighting. Data of a general
nature shall not be acceptable.

I. Shop Drawings:
   1. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to
      show all pertinent aspects of the item.
   2. Electronic shop drawing submittals are required.

PART 2 PRODUCTS
A. Not applicable

PART 3 EXECUTION
3.1 SUBMITTALS

A. Make submittals of product data, shop drawings, samples, quality assurance submittals, quality control submittals, and other items in accordance with the requirements of this section, applicable sections in Division 23, and additional requirements of each individual Division 23 specification section.

B. Grouping of Submittals:
   1. The submittal package shall be coordinated and included in a single submission. Multiple submissions are not acceptable except where prior written approval has been obtained from the engineer. Partial submittals may be rejected, without being reviewed, as not complying with the provisions of the contract.
   2. In the case that multiple submittals are approved, it is the responsibility of the contractor to maintain and update a submittal check list. The contractor shall ensure that all applicable submittal sections are submitted to the Engineer. If a submittal section is not submitted, it will be considered rejected until reviewed by the Engineer.
   3. If submittal sections are submitted as individual submittal files, the submittal sections will be grouped and returned as one file with one set of submittal responses.

C. Electronic Submittal Organization:
   1. Electronic submittals are to be submitted as a single PDF file. Within the PDF file, each section shall be bookmarked.
   2. Provide an electronic submittal cover sheet that lists at least the following:
      a. Project name
      b. Date
      c. Name and address of architect
      d. Name and address of engineer
      e. Name, address and telephone number of prime contractor
      f. Name, address and telephone number of HVAC contractor
      g. Name, address and telephone number of HVAC supplier
   3. Provide an electronic index sheet listing all items submitted.
   4. The contractor shall call to the attention of the engineer, clouded in the submittal and noted after the index sheet, any instance in which the submittals are known to differ from the requirements of the contract documents.
   5. Organize all required items by specification section. The material for each specification section shall be organized as follows:
      a. Provide an electronic section cover sheet that lists the same information as the submittal cover sheet, plus the specification number and title and the name, address and telephone number of the vendor or vendor’s representative, if applicable.
      b. Refer to the individual Division 23 specification sections for any required organization of the submittal material within each submittal section.
      c. Bookmarked sections shall be arranged by specification section number in numerical order.
      d. Submit in accordance with these procedures and procedures described in Division 01 Submittal Procedures.
      e. Submittals not organized as described here may be rejected, without being reviewed, as not complying with the provisions of the contract.

D. Response to engineer’s review:
   1. Review comments: Review comments of the engineer will either be shown on the returned sets to the contractor or shown on a document attached to the sets. If the comments are on an attached document, then the engineer will place a note on the submittal referring to the attached comments. In such cases, the engineer’s signature will appear only on the attached document. If the attached, signed document becomes physically separated from the submittal, then the submittal will no longer be considered as being a reviewed submittal.
2. Complete rejection: If the submittal is not complete or does not meet the requirements of this specification section, then the engineer may reject the entire submittal and return the submittal without further review or comment. In such cases, the entire submittal shall be completely revised and resubmitted. The resubmittal shall be given a new submittal number and shall be documented and processed as a separate submittal from the original.

3. Held for completion: If the submittal is not complete, but is only missing some minor item, the engineer may, at the engineer’s sole discretion, hold the submittal rather than rejecting and returning the submittal. In such cases, the engineer will notify the architect and contractor that the submittal is being held for completion. The contractor will be given a predetermined amount of time to provide the missing item. Upon receipt of the missing item, the engineer will insert the missing item into the submittal package and proceed with the review process.

4. Partial rejection: The engineer may reject only certain portions of the submittal. In such cases, only those rejected portions or items need to be revised and resubmitted.

5. Provide as noted and corrected: The engineer may note a required change to a submitted item, but may not consider the change serious enough to require a resubmittal. In such cases, the engineer will note that the item is to be provided as noted or corrected. In such cases, the contractor may proceed to provide the item. However, if subsequent observations reveal that the noted change was not made, then the contractor shall be liable for removal and replacement of the item at no additional cost to the owner.

6. Reviewed without comment: The contractor may proceed to provide all materials and equipment as submitted.

E. Close-out Submittals:

1. Provide close-out submittals in accordance with the requirements of Division 1.
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<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Remarks</th>
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<tr>
<td>23 05 53</td>
<td><strong>Identification for HVAC Piping and Equipment</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Label material and attachment method (No adhesives)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sample identification tag(s)</td>
<td></td>
</tr>
<tr>
<td>23 34 16</td>
<td><strong>HVAC Fans</strong></td>
<td></td>
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<td></td>
<td>Fan manufacturer</td>
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<td></td>
<td>Voltage/ phase</td>
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<td></td>
<td>Unit capacity</td>
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</tbody>
</table>

1 - Reviewed  
2 - Furnish as corrected in comments, resubmit not required  
3 - Revise and Resubmit based on comments  
4 - Rejected based on comments
SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES
   A. Identification required for mechanical systems.
   B. Code required identification not shown on plans nor specified herein shall be provided.

1.3 RELATED SECTION
   A. Section 23 00 00 – Basic Mechanical Requirements

1.4 SUBMITTALS
   A. Provide submittal data on all items specified in this section in accordance with Specification Section 23 00 90, General Conditions, and Division 01.
   B. Submit wording of nameplates with submittals.
   C. Submit list of all products incorporated in this section.

1.5 REFERENCES
   A. Comply with ANSI A13.1
   B. USAS Code B31.8
   C. NTSB-PSS-73-1
   D. AGA

1.6 DESCRIPTION OF WORK
   A. Nameplates and tags are to be provided for all mechanical equipment and piping in the project.
      Identification is also required for the following, but is not limited to:
      1. Fans
      2. Unit Heaters

PART 2 PRODUCTS

2.1 MANUFACTURERS
   A. Seton
   B. Brady
2.2 EQUIPMENT LABELS

A. Type: Engraving-Stock, melamine plastic laminate, 3 layer.
   1. Thickness:
      a. Less than 25 square inches: 1/16 inch
      b. 25 square inches or more: 1/8 inch

B. Color:
   1. Black

C. Conform to FS L-P-387A

2.3 LETTERING

A. Style:
   1. Engraved standard print.

B. Size:
   1. 3/16 inch to 1/4 inch

C. Color:
   1. White letters, black background

2.4 NAMEPLATE/TAG INFORMATION

A. HVAC Equipment:
   1. Unit mark from Drawings/Owner
   2. Voltage - Phase
   3. Manufacturer and Model Number
   4. Filter size

2.5 NAMEPLATE FASTENERS

A. Securely attach nameplates to equipment with non-corroding stainless steel screws.

B. Non-corroding pop rivets are acceptable.

C. Stick-ons or adhesives will not be allowed.

2.6 IDENTIFICATION OF PRODUCTS

PART 3 EXECUTION

3.1 GENERAL

A. Contractor shall verify room numbers with Owner/Engineer before nameplates are fabricated.

B. The following shall be permanently and clearly identified:
   1. Each unit heater and fan.
3.2 INSTALLATION

A. Install signs on non-removable panels. Attach to equipment with pop rivets or stainless steel screws.

B. Mount in an easily visible location.

C. All labeling identification shall conform to final room numbers. Coordinate with General Contractor, A/E and Owner to secure construction room numbers.

D. Provide all additional signage required by local authority at no cost to the Owner.

E. Provide filter sizes and quantity on all air handlers.

F. Complete installation in accordance with ANSI A13.1 and manufacturer’s installation instructions and with the Drawings. Fasten each unit securely in place with stainless steel screws.

G. Equipment Labeling:
   1. Install on scheduled items of equipment, including the following:
      a. Air conditioning equipment
      b. Control panels and major control components
      c. Include Mark Number and descriptive name from Drawing and Specification schedules
      d. Attach with corrosion resistant, stainless steel screws or pop rivets
      e. Install 1/2" diameter adhesive marker (color to be approved by A/E), and apply to T-bar below any mechanical equipment and fire dampers above lay-in ceiling.

END OF SECTION
SECTION 23 34 16

HVAC FANS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES

A. High Volume, Low Speed (HVLS) fans

1.3 RELATED SECTION

A. Section 23 00 00 – Basic Mechanical Requirements

1.4 REFERENCES

A. AMCA – Air Moving and Conditioning Association, Inc.
B. UL – Underwriter’s Laboratory

1.5 QUALITY ASSURANCE

A. UL Listed and Bear Label
B. Tested in accordance with AMCA standards

1.6 SUBMITTALS

A. Provide submittal data on all items specified in this section in accordance with Specification Section 23 00 90, General Conditions, and Division 01.
B. Submit product data indicating typical catalog data, including arrangements, dimensions, general assembly, and materials used in fabrication.
C. Provide in table form a schedule similar to drawings with data listing all fans, information, accessories, etc.
D. Indicate mechanical and electrical service locations and requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Big Ass Fans
B. Macro Air
C. Serco
2.2 GENERAL

A. Provide fan type, arrangement, capacity, size, motor horsepower, and motor voltage as shown on the drawings.

B. Rate fans according to appropriate Air Moving and Conditioning Association, Inc. (AMCA) approved test codes and procedures. Seal to be attached.

C. Supply fans with sound ratings below the maximums permitted by AMCA standards.

D. All fans provided must bear the UL Label.

E. Sound levels shall be as listed or quieter. Fans with excessive noise will be replaced at Contractor's expense.

F. Fans are to be supplied with engraved aluminum nameplates indicating CFM, static pressure, manufacturer, serial number, and model number.

2.3 HIGH VOLUME, LOW SPEED FANS

A. Type:
   1. Axial fan suspended from structure, gear driven with variable speed control and extruded aluminum alloy airfoils.

B. Motor:
   1. 1725 RPM, totally enclosed, fan cooled with an IP42 NEMA Classification.

C. Onboard Fan Control:
   1. Pre-wired and factory programmed variable frequency drive.

D. Mounting:
   1. The mounting system shall be designed for secure installation on a variety of structural supports. Mounting post shall provide a structural connection between the fan assembly and extension tube. The mounting post shall be powder coated, formed A36 steel with no welds.

E. Cooling:
   1. Variable speed control to provide cooling and de-stratification.

F. Gearbox:
   1. High efficiency, hermetically sealed enclosure with two-stage gearing.
   2. Lubrication of bearings shall be high-grade, low foaming synthetic oil.

G. Construction:
   1. Airfoils shall be extruded aluminum alloy.
   2. Mounting system shall be formed A36 steel, powder coat finish.
   3. Fan hub shall be precision cut aluminum.
   4. Easy accessible.

H. Wall Controller:
   1. Provide 100% control of all fan functions.
   2. Touchpad controls with LED display to control fan direction, speed, operation, and programming.
   3. Provide adequate cabling from wall controller to fan.
I. Features:
   1. Safety cables must be factory provided. Field constructed safety cables are not permitted.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install fans according to the manufacturer's instructions and in the locations shown on the drawings.

B. Mounting structure must support weight and operational torque of HVLS fans.

C. Airfoils must be free of obstructions such as lights, cables, sprinklers, etc. Airfoils must be a minimum 2'-0" from all obstructions.

D. HVLS fans shall be centered approximately between columns, other structural elements. Coordinate with architect for aesthetics.

E. Vertical clearance between HVLS fan and sprinkler deflector shall be a minimum 3'-0".

F. All HVLS fans shall be interlocked to shut down immediately upon receiving a water flow signal from the fire alarm system in accordance with the requirements of NFPA 72.

3.2 START-UP

A. Start fans to verify rotation and operation sequence prior to test and balance.

3.3 IDENTIFICATION

A. Provide identification per Section 23 05 53.

END OF SECTION
SECTION 23 82 39

ELECTRIC UNIT HEATERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES

A. Electric unit heaters.

1.3 RELATED SECTION

A. Section 23 00 00 – Basic Mechanical Requirements

1.4 REFERENCES

A. UL – Underwriters Laboratories and Bear Label

B. NEC – National Electric Code

1.5 SUBMITTALS

A. Provide submittal data on all items specified in this section in accordance with Specification Section 23 00 90, General Conditions, and Division 1.

B. Submit product data with ratings, capacities, electrical connections, etc.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Berko

B. Indeeco

C. Markel

D. Qmark

E. Redd-i

F. Trane

2.2 GENERAL

A. Provide electric unit heater with capacity, horsepower, and motor voltage as shown on schedule.
2.3 FEATURES

A. Draw through design.
B. Fan and limit safety controls.
C. Supply voltage as shown on drawings.
D. 24 Volt transformer and terminal block.
E. All elements 80/20 nichrome wire and copper clad steel sheath.
F. Automatic reset thermal overloads – instantaneous de-energizing.
G. Fan guard.
H. Mounting brackets.
I. Horizontal directional louvers.
J. Threaded suspension couplings (2, 1” ISP).
K. Baked enamel finish. Cabinet 18 ga. baked enamel finish.
L. Manual summer winter switch on thermostat base with relay.
M. Units to bear UL listing and meet NEC requirements.

2.4 MOTORS

A. Totally enclosed, designed for continuous duty, built-in overload protection.
B. 25 kW and larger to have 2-speed motors.
C. Heaters that draw 48 amps or greater shall be provided with factory installed, subdivided and fused circuits.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install per manufacturer's instructions and locations shown on plans.
B. Install for service access to any electrical control panel, etc.

3.2 IDENTIFICATION

A. Per Section 23 05 53.

END OF SECTION
# ELECTRICAL

## DIVISION 26

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>26 00 00</td>
<td>Electrical</td>
</tr>
<tr>
<td>26 00 30</td>
<td>Warranty Period</td>
</tr>
<tr>
<td>26 00 90</td>
<td>Electrical Submittal Procedures</td>
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<tr>
<td>26 05 26</td>
<td>Grounding And Bonding for Electrical Systems</td>
</tr>
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<td>26 05 33.11</td>
<td>Raceways And Conduits for Electrical Systems</td>
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<td>26 05 33.13</td>
<td>Boxes And Fittings for Electrical Systems</td>
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<tr>
<td>26 05 53</td>
<td>Identification For Electrical Systems</td>
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<td>26 08 11</td>
<td>Testing of Electrical System</td>
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<td>26 09 41</td>
<td>Lighting Controls</td>
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<tr>
<td>26 22 13</td>
<td>Low Voltage Distribution Transformers</td>
</tr>
<tr>
<td>26 24 16</td>
<td>Panelboards For Distribution Switchgear</td>
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<tr>
<td>26 27 26</td>
<td>Wiring Devices</td>
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<tr>
<td>26 28 13</td>
<td>Fuses</td>
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<tr>
<td>26 28 16</td>
<td>Enclosed Safety Switches And Circuit Breakers</td>
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<tr>
<td>26 50 00</td>
<td>Lighting</td>
</tr>
</tbody>
</table>
SECTION 26 00 00

ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Bidding requirements, contract forms, conditions of the contract, Division 1 - General Requirements apply to work of this division.

1.2 SECTION INCLUDES

A. Furnishing of all materials, equipment, tools, scaffolding, labor and transportation required for the complete installation of the electrical systems as shown on the drawings and as specified herein.

B. Bidders shall determine the contents of a complete set of drawings and specifications and be aware that they may be bidding from a partial set of drawings, applicable only to the various separate contracts, subcontracts, or trades as may be issued for bidding purposes only. The contract documents and the complete scope of work for the project are illustrated on the combined Architectural, Structural, Plumbing, Heating, Ventilating, Air Conditioning and Electrical, and each Bidder shall thoroughly acquaint himself with all the details of the complete set of drawings and specifications before submitting his bid. All drawings and specifications form a part of the contract documents for each separate contract and shall be considered as bound therewith in the event partial sets of plans and specifications are issued for bidding only. The submission of bids shall be deemed evidence of the review and examination of all drawings, specifications, and addenda issued for this project as no allowances will be made because of unfamiliarity with any portion of the complete set of documents.

C. It is the intent of these specifications to provide complete installations even though each and every item necessary is not specifically mentioned or shown. In general, the work specified in this section shall consist of, but is not limited to, the following:

Electrical demolition.
1. Systems of raceways, conductors, cables, boxes, receptacles, wiring devices, and cover plates.
2. Relays, wiring, devices, contactors, conduit and other required equipment for all systems and details shown on the electrical drawings.
3. Electrical identification.
4. Surge Protective Devices (SPDs)
5. Utility services, utility requirements, including conduit and coordination.
6. Switchgear including switchboards and panelboards.
7. Secondary electrical service and distribution system including wiring.
8. Lighting fixtures, lamps and ballasts.
9. Coordination and final connection to all line voltage systems or equipment provided under other divisions.
10. Testing of wire and cable installation.
11. Submittals and shop drawings.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Control wiring of HVAC and related equipment as specified in other sections.

B. Motor starters required on HVAC and related equipment as specified in other divisions and sections.
1.4 CODES, STANDARDS AND THEIR ABBREVIATIONS

A. Perform all Division 26 work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are modified by the contract documents.

B. In addition to the requirements outlined in other sections of the specifications the following standards are imposed as applicable to the work in each instance:

1. NECA standards for installation.
2. NFPA No. 70, National Electric Code.
3. Local Codes and Ordinances.
5. Title 25, Health Services, Part 2, Texas Department of Health, Chapter 145, Long Term Care Subchapter Q.
6. OSHA Standard 2207 – Construction Industry Standard
7. OSHA 29 CFR 1926 - Regulation of Excavation
8. Texas Underground Facility Damage Prevention Act (H.B. 2295)

C. Where local codes or practices exceed or conflict with the NEC, it shall be the Contractor's responsibility to perform the work in accordance with the local code prevailing and local interpretations thereof. Any such additional work shall be performed at no additional cost to the Owner.

D. Materials and components shall be UL listed and approved for the purpose intended.

E. The Contractor shall obtain all permits required to commence work and, upon completion of the Work, obtain and deliver to the Owner's Representative a Certificate of Inspection and Approval from the State Board of Fire Underwriters, the City of Heath, Texas and other authority having jurisdiction. The Contractor shall pay required permit fees.

1.5 LIST OF ASSOCIATIONS AND STANDARDS

A. The following abbreviations are applicable for this entire division.

1. ANSI - American National Standards Institute, 1430 Broadway; New York, NY 10018.
3. CBM - Certified Ballast Manufacturers Association, 2116 Keith Building; Cleveland, Ohio 44115.
4. IEEE - Institute of Electrical and Electronics Engineers, 345 East 47th Street; New York, NY 10017.
5. ICEA - Insulated Cable Engineers Association, P.O. Box P; South Yarmouth, MA 02664.
6. NEC - National Electrical Code; NFPA No. 70.
8. NEMA - National Electrical Manufacturers Association, 155 East 44th Street; New York, NY 10017.
10. NFPA - National Fire Protection Association, 60 Batterymarch Street; Boston, MA 02110.
11. OSHA - Occupational Safety and Health Administration, US Department of Labor; Washington, DC 20402.
12. UL - Underwriters Laboratories, Inc., 333 Pfiffigen Road; Northbrook, IL 60062.
B. Nothing in the Contract Documents shall be construed to permit work not conforming to these codes. When two or more codes or standards are applicable to the same work, then the stricter code or standard shall govern.

C. The date of the code or standard is that in effect on the date of issue of the contract documents except when a particular publication date is specified.

D. This Contractor shall comply with all State, Federal, NFPA, local codes and ordinances that may alter any part of the plans or specifications. This Contractor shall bear all costs for correcting any deficiencies due to non-compliance.

E. Where local codes and ordinances are not in writing or on record but a local precedence has been set, the Owner shall pay for any additional resulting cost.

1.6 DEFINITIONS

A. Approval: It is understood that approval must be obtained from the Architect in writing before proceeding with the proposed work. Approval by the Architect of any changes, submitted by the Contractor, will be considered as general only to aid the Contractor in expediting his work.

B. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Architect, requested by the Architect, and similar phrases.

C. Furnish: The term furnish means to equip with what is needed, supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

D. Install: The term install describes operations at the Project site including setting in position, connecting on adjusting for use, the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

E. Provide: Defined as requiring the furnishing, supplying, to make available, and installation of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically noted.

F. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.

1.7 ABBREVIATIONS FOR ELECTRICAL DRAWINGS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Amperes</td>
</tr>
<tr>
<td>ALT</td>
<td>Alternate</td>
</tr>
<tr>
<td>AFF</td>
<td>Above finish floor</td>
</tr>
<tr>
<td>AFG</td>
<td>Above finished grade</td>
</tr>
<tr>
<td>AWG</td>
<td>American wire gauge</td>
</tr>
<tr>
<td>ATS</td>
<td>Automatic transfer switch</td>
</tr>
<tr>
<td>CLG</td>
<td>Ceiling</td>
</tr>
<tr>
<td>CKT</td>
<td>Circuit</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed circuit television</td>
</tr>
<tr>
<td>DFA</td>
<td>Down from above</td>
</tr>
<tr>
<td>DISC</td>
<td>Disconnect</td>
</tr>
<tr>
<td>EWC</td>
<td>Electric water cooler</td>
</tr>
<tr>
<td>EXIST</td>
<td>Existing</td>
</tr>
<tr>
<td>FAP</td>
<td>Fire alarm plan</td>
</tr>
</tbody>
</table>
1.8 NEMA CLASSIFICATIONS

A. For complete definitions and listing see NEMA Standards.
   Type 1  General Purpose, Indoor.
   Type 2  Drip-proof, Non corrosive, Indoor.
   Type 3R Rain proof, Outdoor.
   Type 4  Watertight and dust tight, Non corrosive, Indoor and outdoor.
   Type 4X Watertight and dust tight, Corrosion resistant. Indoor and outdoor.
   Type 12 Dust tight, Drip-tight, Non corrosive, Indoor. See NEC 2008 110.22 FPN.

1.9 PROJECT/SITE CONDITIONS

A. Before submitting a proposal, each bidder shall examine all plans and specifications relating to the work, shall visit the site of the project and become fully informed of the extent and character of the work required, including all required utilities.

B. No consideration will be granted for any alleged misunderstanding of the materials to be furnished or the amount of work to be done, it being fully understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein, or indicated on the accompanying plans or required by nature of the site of which may be fairly implied as essential to the execution and completion of any and all parts of the work.

1.10 SUBMITTALS

A. Refer to Section 26 00 90, Electrical Submittal Procedures.

1.11 QUALITY ASSURANCE

A. Provide complete installations of and verify that all systems, comply with NFPA 70, latest edition. The more stringent of the N.E.C. or specifications shall apply to this project.
B. All materials furnished under this Contract shall be new, free from defects of any kind, of the quality and design hereinafter specified, and shall conform to the standards of Underwriter's Laboratories Inc., except for equipment which U.L. does not list or provide label service.

C. Submit a bid on the basis of a complete installation including all labor, material, delivery, insurance, permits, inspection fees and tests required even though each and every item necessary is not specifically mentioned or shown.

D. In case of any conflict between the specifications, plans and ordinances, the ordinances shall govern. In case of any conflict between the specifications and plans, the Engineer shall make the final decision. Refer to Division 1 - General Requirements.

1.12 CONTRACTOR'S RESPONSIBILITY

A. Erect barricades, protective fencing, and signs as required to prevent injury to personnel on site.

B. Coordinate all utility services and/or revisions with utility companies for base bid.

C. Make permanent connection to new utilities or existing lines. Determine depth and location, and bid accordingly. Relocate and repair any existing lines cut by general construction work.

D. Plans do not show exact location and elevations of lines. Deviate from plans as required to conform to the general construction, provide proper grading and installation.

E. Maintain all utility services during construction to existing portions of job that remain.

F. Procure and pay for all necessary permits or licenses to carry out the work. Pay all costs in connection with metering.

G. Obtain and pay for all the necessary certificates of approval which must be delivered to the Architect before final acceptance of the work.

H. Periodically remove rubbish, clean or repair all surfaces marred by the work required under this contract.

I. Where job conditions require changes in indicated locations and arrangement, make such changes without extra cost to Owner.

J. Exposed piping and/or other materials will not be permitted in the finished job except where noted on the drawings.

K. Provide required hook-up to line voltage at all electromagnetic door holder/release, fire/smoke dampers, and smoke dampers. Provide required relays and wiring to fire alarm panels and coordinate with other specified work.

L. Accomplish all demolition and remodeling work involving this trade in a manner and completeness to provide the appearance of new construction work.

M. Replace any usable equipment and/or structure damaged during demolition and remodel work.
1.13 SUBSTITUTION OF PRODUCTS

A. Substitution of products specified herein will be considered only when a complete list of proposed alternative equipment is submitted to the Engineer in writing, supported by adequate technical and cost data. This includes a complete description of the proposed substitution, drawings, catalog cuts, performance data, test data, or any other data or information necessary for evaluation.

B. All proposed substitutions and data must be received by the Engineer no less than ten working days prior to the schedule date for opening of bids.

C. The Engineer will consider all such submittals and the Architect will issue an addendum listing items which the Engineer considers acceptable. Only such items as specified or approved as acceptable will be installed on this project.

D. Manufacturers' names are listed herein and on the plans to establish a standard of quality and design. Where a manufacturer's name is mentioned, products of other manufacturers will be acceptable, if in the opinion of the Engineer, the substitute material is of equivalent quality or better than that of the material specified.

E. The Contractor's Bid represents that the bid price is based solely upon the materials and equipment described in the Bid Documents (including addenda, if any) and that he contemplates no substitutions or extras.

F. Items noted as "No Substitutes" shall be as specified only.

G. Samples shall be provided by the manufacturer of the proposed substitute unit for evaluation when required at no charge and non-returnable.

H. Requests for substitution are understood to mean that the Contractor:
   1. Has personally investigated the proposed substitution and determined that it is equivalent or superior in all respects to that specified.
   2. Will provide the same guarantee for the substitution that he would for that specified.
   3. Will, at no cost to the Owner, replace the substitute item with the specified product if the substitute item fails to perform satisfactorily.

I. After Award of the Contract, substitutions will be considered only under one or more of the following circumstances.
   1. The substitution is required for compliance with subsequent interpretations of code or insurance requirements.
   2. The specified product is unavailable through no fault of the Contractor.
   3. The manufacturer refuses to warranty the specified products as required.
   4. Subsequent information that the specified product is unable to perform properly or to fit in the designated space.
   5. In the Engineer's sole judgment, the substitution would be in the Owner's best interest.

J. Revisions to the electrical system caused by substitutions shall be under the supervision of the Engineer at a standard hourly rate charged by the Engineer and shall be paid by the Contractor originating the changes.

1.14 PROJECT RECORD DOCUMENTS

A. This Contractor shall keep a set of plans on the job, noting daily all changes made in connection with the final installation including exact dimensioned locations of all new and existing switchgear, devices, fixtures, equipment and new or existing site utilities and lights.
B. Upon submitting his request for final payment, he shall turn over to the Architect, record document submittals as outlined in Division 1 - General Requirements of the Specifications.

C. In addition to the above, the Contractor shall accumulate during the job's progress the following data, in duplication. Two (2) each prepared in a three inch (3"), 3-ring binder, neat in appearance of sufficient size and turned over to the Architect for checking and subsequent delivery to the Owner:
   1. All warranties, guarantees and manufacturer's directions on equipment and material covered by the Contract.
   2. All shop drawings.
   3. Set of operating instructions. Operating instructions shall also include recommended maintenance and seasonal changeover procedures.
   4. Any and all other data and/or plans required during construction.
   5. Repair parts lists of all major items and equipment including name, address and telephone number of local supplier or agent.

D. The first page, or pages, shall have the names, addresses, and telephone numbers of the following:
   1. General Contractor and all sub-contractors.
   3. Submit megger reading log copies in accordance with Section 26 08 11.
   4. Submit ground tests methods and results in accordance with Section 26 08 11 & 26 05 26.
   5. Submit testing of electrical system results in accordance with Section 26 08 11.
   6. Submit test data results for transformers in accordance with Section 26 22 13.

1.15 PLANS AND SPECIFICATIONS

A. The intent of the drawings is to establish the types of systems and functions, but not to set forth each item essential to the functioning of the system.

B. Electrical drawings are generally diagrammatic and show approximate location and extent of work.

C. Install the work complete including minor details necessary to perform the function indicated. Provide an electrical system (including all hook ups) complete in every respect and ready to operate.

D. If clarification is needed, consult the Engineer.

E. Review pertinent drawings and adjust the work to conditions shown. Where discrepancies occur between drawings, specifications, and actual field conditions, immediately notify the Engineer for his interpretation.

F. The Architect reserves the right to make any reasonable change in the location of any part of this work without additional cost to the Owner.

G. Contractor, subcontractor, vendors and suppliers are required to waive subrogation against Owner and Engineer.

1.16 ELECTRICAL WIRING AND EQUIPMENT FOR MECHANICAL SYSTEMS

A. Electrical Contractor To Provide
   1. Line Voltage and hook-up to all plumbing equipment (Division 22), HVAC equipment (Division 23), and building automation equipment (Division 25), including required manual safety switches with fuses/heaters of required size.
2. All conduit into accessible attic space for thermostats and sensors.
3. All lighting contactors, mechanically held with control relay, required coil voltage coordinated with controls contractor.
4. Junction Boxes (Standard One or Two Gang) required for controls contractor, and coordination with controls contractor.

B. Mechanical Contractor to Provide
1. All motor starters (with heaters as required).
2. All thermostats.
3. All HVAC Equipment.
4. All relays, contactors, and switches required to start/stop Mechanical Equipment other than switches shown on and required by Division 26.

C. Controls Contractor to Provide
1. All required relays associated with Controls in specifications.
2. All sensors.
3. All conduit required above ceiling.
4. All control wiring.

D. The Electrical plans are based on the equipment and devices scheduled shown on the drawings or as called for in the specifications. Should any mechanical equipment or device associated devices be changed or accepted from those which are shown or noted, all electrical and/or mechanical changes shall be made at the expense of the trade or contractor initiating the change with no expense to the Owner, Architect, Engineer or their representatives.

E. All conduit and boxes for thermostats and/or sensors shall be provided by this contractor. A thermostat or sensor junction box and 1/2" conduit to accessible attic and/or to corridor shall be provided for each room served with HVAC equipment. Coordinate with Division 23 for exact locations and requirements.

F. Details on Electrical drawings showing HVAC/Mechanical/Control Equipment providing of various relays devices, wiring and other equipment shall be provided by this Contractor as directed and as required per drawing.

1.17 UTILITIES, LOCATIONS, AND EXISTING CONDITIONS

A. Location of power company electrical service poles, transformers, telephone service pedestal, cable television service, and any existing underground services, where shown, have been obtained from substantially reliable sources, are shown as a general guide only, without guarantees as to accuracy.

B. The Contractor will examine the site, verify all requirements, service points, and availability of all services required to complete this project. No consideration will be granted for any alleged misunderstanding of the materials and labor to be provided as necessitated by nature of the site including those items which may be fairly implied as essential to the execution and completion of any and all parts of this project. All proposals shall take these existing conditions into consideration and the lack of specific information on the drawings shall not relieve the Contractor of any responsibility. Verify location and check for existing underground utilities and lines before ditching.

C. The Contractor shall be responsible for repair of any cut or damaged lines or utilities he uncovers. There are lines and utilities not shown on any plans.
1.18 FINAL COMPLETION REQUIREMENTS

A. The following will be required at time of final completion.
   1. Refer to general conditions.
   2. Final clean up completed.
   3. All systems are fully operational, all material and devices installed and tested.
   4. Ground tests (megger readings) performed, two copies of method used, and results attached.
   5. Project Record Documents submitted to the Architect.
   6. Spare material delivered to the Owner and documented.
   7. Owner instructions completed.

1.19 MANUFACTURER’S INSTRUCTIONS

A. All equipment and devices shall be installed in accordance with the drawings and specifications, manufacturer's instructions and applicable codes.

B. Where specifications call for installation of a product to be in accordance with manufacturer's instructions and/or where manufacturer's instructions are required for installation of a product, it shall be the contractor's responsibility to obtain the necessary applicable manufacturer's instructions and install the product in accordance with the manufacturer's instructions. It shall be the Contractor's responsibility to install all equipment, materials, and devices shown on the plans and as called out in these specifications even if manufacturer’s instructions are absolutely unattainable.

1.20 INSTALLATION

A. Cooperation with trades of adjacent, related or affected materials or operations, and or trades performing continuations of this work under subsequent contracts is considered a part of this work in order to effect timely and accurate placing of work and to bring together, in proper and correct sequence, the work of such trades, including under the general contractor Division 1, and Division 23.

B. The Electrical Contractor shall coordinate installation of the electrical system with the General Contractor, Mechanical, Plumbing, and Communications Contractors to insure a complete working system for the Owner.

C. Where required, all conduit and boxes for all systems, except mechanical controls specified otherwise, shall be provided by the Electrical Contractor. Any and all allowances shall be included.

D. All wiring shall be enclosed in conduit or raceway in all exposed areas such as gymnasium, shops, stages, or field houses.

E. Work must be performed by workmen skilled in their trade. The installation must be complete whether the work is concealed or exposed.

F. The Contractor shall construct foundations for floor mounted equipment where indicated on the Drawings. Foundations generally shall be built up from structural floor slabs and shall be made of 3000 psi concrete four (4) inches thick unless otherwise indicated or specified. Top edges shall be beveled. All exposed surfaces shall be finished with cement mortar troweled smooth. Reinforcing shall be 6 x 6-10/10 welded wire mesh.

G. Equipment shall be secured to foundations by this Contractor with anchor bolts embedded in the concrete of ample size and proper arrangements to suit equipment furnished.
H. Conceal electrical work in walls, floors, chases, under floors, underground and above ceilings. Branch circuits shall not be installed in or under the slab, and will not be accepted unless shown or required on the drawings.

I. Coordinate the actual locations of electrical outlets and equipment with building features and mechanical equipment as indicated on architectural, structural and mechanical drawings. Review with the Architect any proposed changes in outlet or equipment location. Relocation of outlets before installation, of up to 3 feet from the position indicated, may be directed without additional cost. Remove and relocate outlets placed in an unsuitable location when so requested by the Architect.

1.21 TEMPORARY SERVICE AND LIGHTING

A. Electrical service to all portions of existing buildings at the construction site not involved with the project shall remain in operation throughout construction. Provide all required temporary electrical service in the base bid to all required areas so as to satisfy OSHA requirements.

B. All metering and temporary electrical service charges and/or costs of utilities shall be paid by The Contractor/Managing Construction Contractor.

1.22 ADDITIONAL MATERIALS:

A. Include in the Base Bid:
   1. All costs to provide 20 additional communication outlet or signal locations, all required boxes, labor and conduit as directed by the Architect. Devices, plates, and wiring by Communications Contractor(s).
   2. All costs to provide one (1) additional electrical circuit as required for fire alarm system signal power expanders or fire safety control circuits including all required circuit breakers, wiring, conduit, labor and devices as specified and directed by Architect.
   3. All costs to provide 5 additional electrical circuits, all required circuit breakers, wiring, conduit, labor and devices as specified and directed by Architect. Each circuit to be priced with a rating of 20 amps and at a distance of 100 feet to furthermost device. Each circuit to include (8) duplex receptacles.
   4. All costs to provide 2 additional lighting circuits, all required circuit breakers, wiring, conduit, labor and devices as specified and directed by Architect. Each circuit to be priced with a rating of 20 amps and at a distance of 100 feet to furthermost device. Each circuit to include 15 light fixtures equal in value to fixture type “B”.
   5. All costs to provide 10 additional exit fixtures equal in value to exits type ‘X’ as noted on drawings, all required wiring, conduit, labor and devices as specified and directed by the Architect. Wiring and conduit to be priced at a distance of 50 feet.
   6. All costs to provide 10 additional light fixtures with battery equal in value to fixture type “BE”.
   7. All costs to provide 10 additional light switches equal to the type denoted on the drawings.
   8. All costs to provide 10 additional 3 way light switches equal to the type denoted on the drawings.
   9. Provide 3 relay packs and 6 occupancy sensors to the owner.

PART 2 PRODUCTS

A. Not Used

PART 3 EXECUTION

A. Not Used

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures during the warranty period.

1.2 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Division 26, Section 26 00 00, apply to this Section.

1. Section 26 00 00 - Electrical

1.3 WARRANTY

A. This Contractor shall warranty all work against defective materials and workmanship for a period of one year from and after date of acceptance of the installation by the owner.

B. Neither the final payment nor any provisions in Contract Documents shall relieve this Contractor, or the Contractor, of the responsibility for faulty materials or workmanship.

C. The contractor shall remedy any defects due thereto, and pay for any damage to other work resulting there from, which shall appear.

D. This Warranty shall not be construed to include the normal maintenance of the various components of the system covered by these specifications.

1.4 MAINTENANCE SERVICE

A. Provide normal maintenance services recommended by the manufacturer at no additional cost to the Owner during the warranty period.

PART 2 PRODUCTS

A. Not Used.

PART 3 EXECUTION

A. Not Used.

END OF SECTION
SECTION 26 00 90

ELECTRICAL SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements section 01 33 00 Submittal Procedures and contains additional requirements applicable to Division 26 submittals.

1.2 SECTION INCLUDES

A. This section includes, but is not limited to:
   1. Electrical submittal procedures
   2. List of required Division 26 submittals to the engineer

B. This section applies only to the Division 26 specifications. Submittals required by other specification divisions are not included here, even though the same subcontractor may be providing work under other divisions.

1.3 RELATED SECTION

A. Section 01 33 00 – Submittal Procedures

1.4 SUBMITTALS

A. The materials, workmanship, design, and arrangement of all work installed under this contract shall be subject to the review of the architect, engineer and owner.

B. Manufacturers: Manufacturers submitted shall be as per the acceptable manufacturers listed in each specification section or referenced schedule. For additional manufacturers requiring approval, reference the Substitution of Products article in section 26 00 00.

C. Required submittals: Refer to the Submittals article of each individual Division 26 specification section for the required items to be submitted.

D. Color selection: Some products require that a color selection be coordinated with the architect. Information regarding such products shall be submitted to the architect.

E. Contractor’s coordination submittals: The contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the project, but such data shall remain between the contractor and his subcontractors and will not be reviewed by the engineer.

F. Electronic Submittals: Provide submittals in pdf format. Paper submittals will be rejected.

G. Coordination correspondence: The contractor may desire to verify the acceptability of a particular item prior to assembling the submittal package. The contractor may send material directly to the engineer for comments and feedback. This communication, whether by mail, fax, or e-mail, will be treated as normal coordination correspondence and will not be tracked or documented as a formal submittal. The engineer may or may not respond to such correspondence. If the engineer agrees, in writing, to the use of a particular item, then that same material shall be included in the submittal package along with a copy of the correspondence.
H. Unapproved products: If materials or equipment are installed before being reviewed and approved by the engineer, the contractor shall be liable for the removal and replacement of such unapproved materials and equipment, at no additional expense to the owner. Additionally, if the removal and replacement of unapproved materials or equipment necessitates the removal and replacement of other related materials or equipment, then the contractor shall be liable for the removal and replacement of the related materials and equipment at no additional expense to the owner.

1.5 PRODUCT DATA

A. Where the content of manufacturer submittal literature includes data not pertinent to the submittal, clearly indicate which portions of the contents are being submitted for review. Catalogs, pamphlets, or other documents submitted to describe items on which review is being requested shall be specific and identifications in catalog, pamphlets, etc., of items submitted shall be clearly made in a contrasting color or highlighting. Data of a general nature shall not be acceptable.

1.6 SHOP DRAWINGS

A. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the item.

B. Types of prints required: Submit in pdf format.

1.7 SEQUENCING

A. Submit product information within 30 calendar days after the contractor has received the owner’s notice to proceed or in accordance with Architect’s requirements, whichever is sooner.

B. After the engineer has reviewed the submittals, make necessary revisions as directed by the engineer and resubmit.

C. After the submittal has been reviewed and approved by the engineer, proceed to purchase materials and perform the work.

1.8 SCHEDULING

A. Failure to submit items that meet the requirements of the contract documents in ample time for review shall not entitle the contractor to an extension of contract time, and no claim for extension by reason of such default shall be allowed. The contractor may be held liable for delays so occasioned.

PART 2 PRODUCTS

A. Not applicable.

PART 3 EXECUTION
3.1 GENERAL

A. Submit product data, shop drawings, samples, quality assurance submittals, quality control submittals, and other items in accordance with the requirements of this section, applicable sections in Division 1, and additional requirements of each individual Division 26 specification section.

3.2 SUBMITTAL ORGANIZATION

A. Provide a submittal cover page that lists at least the following:
   1. Project name
   2. Date
   3. Name and address of architect
   4. Name and address of engineer
   5. Name, address and telephone number of electrical distributor
   6. Name, address and telephone number of prime contractor
   7. Name, address and telephone number of electrical contractor

B. Provide an index page listing all items submitted.

C. The contractor shall call to the attention of the engineer by letter, included in the submittal after the index page, any instance in which the submittals are known to differ from the requirements of the contract documents.

D. Organize all required items by specification section. All material for each specification section shall be in one single pdf file. Material for multiple specification sections may be combined into one file.

E. The material for each specification section shall be organized as follows:
   1. The first page shall indicate the specification number and title and the name, address and telephone number of the vendor or vendor’s representative, if applicable.
   2. Refer to the individual Division 26 specification sections for any required organization of the submittal material within each submittal section.

F. Submit in accordance with the procedures described in specification section 01 33 00 Submittal Procedures.

G. Submittals not organized as described here may be rejected, without being reviewed, as not complying with the provisions of the contract.

3.3 CLOSEOUT SUBMITTALS

A. Provide close-out submittals in accordance with the requirements of Division 1.

3.4 SCHEDULES

A. Division 26 Submittal Schedule: The Division 26 submittal shall include the following items for each Division 26 specification section that is in the contract documents. Coordinate this list with the submittal requirements listed in each specification section. If an item has been omitted from either list but is included in the other, then provide that item in the submittal. In case of conflicting or unclear requirements, contact the engineer.
B. Refer to checklists below.

<table>
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<th>Section</th>
<th>Submit on the following</th>
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<tr>
<td>26 05 26</td>
<td>Grounding and Bonding for Electrical Systems</td>
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<tr>
<td>26 05 33.11</td>
<td>Raceways and Conduits for Electrical Systems</td>
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<tr>
<td>26 05 33.13</td>
<td>Boxes and Fittings for Electrical Systems</td>
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<tr>
<td>26 05 53</td>
<td>Identification for Electrical Systems</td>
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<tr>
<td>26 09 41</td>
<td>Lighting Controls</td>
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</tbody>
</table>

**Grounding and Bonding for Electrical Systems**
- Grounding materials and devices

**Raceways and Conduits for Electrical Systems**
- Raceways and conduit
- Fittings
- Wireways
- Supports for rooftop conduits
- Labeling

**Boxes and Fittings for Electrical Systems**
- Fittings
- Cover plates
- Junction boxes
- Outlet boxes
- Pull boxes
- Floor boxes
- Extension rings

**Identification for Electrical Systems**
- Label material
- Sample identification tag

**Lighting Controls**
- Motion Sensors
- Wall sensors
- Photocells
- Smart switches
- Time switches
- Room controllers
- Enhanced building controls (if required)
- Software
- Lighting contactors
- Low voltage wiring
- Shop drawing - RCP
- Shop drawing - wiring diagrams
- Sequence of operations for each unique space
- List of switch types by unique space with proposed button labels
- Motion Sensors
- Wall sensors
- Photocells
- Smart switches
- Time switches
- Room controllers
- Enhanced building controls (if required)
- Software
- Lighting contactors
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1 - Reviewed  
2 - Furnish as corrected in comments, resubmit not required  
3 - Revise and Resubmit based on comments  
4 - Rejected based on comments

END OF SECTION
SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

A. This Section includes solid grounding of electrical systems and equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other sections of these Specifications.

1.3 RELATED SECTIONS

A. Section 26 00 00 - Electrical
B. Section 26 08 11 - Testing of Electrical System

1.4 REFERENCES

A. National Electrical Code

1.5 SUBMITTALS

A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements.
B. Submit grounding materials and devices to be used.
C. Submit test results of megger reading to Engineer after installation of grounds with records for Owner.
D. Revisions to grounding will be to satisfaction of the Engineer at no cost by the Contractor.

PART 2 PRODUCTS

2.1 GROUND RODS

A. Copper cladding permanently bonded to a high-strength steel core, molten welded to core.
B. 3/4 inch by 10 feet (19mm by 30m) Straight, Conform to UL 467.
2.2 CONNECTIONS

2.2.1 GENERAL CONNECTION REQUIREMENTS

A. Listed and labeled as grounding connectors for the materials used.

2.2.2 OUTDOOR & BELOW GRADE GROUNDING CONNECTIONS

A. Welded.
B. Provide starting material in kit form.
C. Aluminum, copper and iron oxide.
D. No phosphorous or any other caustic, toxic or explosive substance may be used.
E. Manufacturer/Model
   1. Erico Products "Cadweld Exothermic"
   2. Thermoweld

2.2.3 OUTDOOR & ABOVE GRADE GROUNDING CONNECTIONS

A. Bonds and clamps.
B. Non-ferrous material which will not cause electrolytic action between the conductor and connector.
C. Provide exothermal welding where clamping is not accessible.

2.2.4 INDOOR GROUNDING & POWER CONNECTIONS

A. Provide clamps as listed for outdoor applications.
B. Use low smoke/low emission welding where not accessible.
C. Manufacturer/Model: Erico Products "Cadweld Exolon".
D. Service Entrance Grounding Connections: U-bolt with pressure plate.

2.3 WIRING

A. Copper 600 volt insulated conductors with a green-colored insulation for bonding.
B. Grounding conductors to be in accordance with NEC Table 250-95.
C. Bonding jumpers to be minimum cross-sectional area greater than or equal to that of the equivalent grounding conductor as determined from NEC Table 250-95.
D. Use to ground electrode and equipment grounding conductors.

2.4 MISCELLANEOUS CONDUCTORS

A. Ground Bus: Bare annealed copper bars of rectangular cross section. 98% IAGS conductivity, not less than 25% of feeders cross section area.
B. Braided Bonding Jumpers: Copper tape, braided No. 3/0 AWG bare copper wire, terminated with copper ferrules.

C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch (1mm) thick and 2 inches (50mm) wide, except as indicated.

2.5 LIGHTNING ARRESTORS

A. Manufacturers: Products of the following manufacturers which meet the requirements of these specifications are acceptable.
   1. Anixter Brothers, Inc.
   2. Blackhawk Industries
   3. Burndy
   4. Copperweld Corporation
   5. Erico Products, Inc.
   6. Ideal Industries, Inc.
   7. Ilsco
   8. ITT Blackburn
   9. Joslyn
   10. OZ/Gedney Co.
   11. Raco, Inc.
   12. Thomas & Betts Corp

PART 3 EXECUTION

3.1 APPLICATION

3.1.1 EQUIPMENT GROUNDING CONDUCTOR APPLICATION

A. Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.

B. All power circuits shall be provided with a separate copper insulated equipment grounding conductor (EGC) run in the raceway with the power conductors. The conduit is not to be used as the sole means of grounding. The insulation of the EGC shall be green.

C. Bonding to the EGC shall be provided at each end of metallic conduit runs and at all boxes and enclosures.

D. All branch circuits and feeders that require an isolated ground (IG) equipment grounding conductor shall be provided with a separate copper insulated IG equipment grounding conductor run in the raceway with the power conductors. The IG equipment grounding conductor shall be provided in addition to the normal EGC. The insulation of the IG equipment grounding conductor shall be green with a yellow stripe.

E. Conduits and boxes of IG circuits shall be bonded to the normal EGC as stated above. At outlet locations, the IG equipment grounding conductor shall connect only to the isolated ground terminal of an isolated ground outlet. There shall be no connection, either directly or indirectly, between the normal EGC and the IG equipment grounding conductor at any point other than at the source of a separately derived system (transformer) or at the service entrance.

F. The following circuits shall be provided with an IG equipment grounding conductor:
   1. Feeders providing power to panels equipped with an IG buss.
   2. All branch circuits originating at a panel with an IG buss.
3.1.2 COMMUNICATIONS

A. For communication systems, provide a #4 AWG minimum green insulated copper conductor in raceway from the grounding electrode system to each terminal cabinet or central equipment location.

3.1.3 METAL POLES SUPPORTING OUTDOOR LIGHTING FIXTURES

A. Ground pole to a grounding electrode as indicated in addition to separate equipment grounding conductor run with supply branch circuit.

3.2 INSTALLATION

3.2.1 GENERAL

A. Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.

3.2.2 GROUND RODS

A. Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches (600 mm) below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Use 3/4 inch by 10-ft. (19mm by 30 m) ground rods except as otherwise indicated. Drive rods until tops are 6 inches (150mm) below finished floor or final grade except as otherwise indicated. Provide "Powerfill" "Gem" or equal conducting material in quantity recommended by manufacturer at all ground rods.

3.2.3 METALLIC WATER SERVICE PIPE

A. Provide insulated copper ground conductors, sized as indicated, in conduit from the building main service equipment, or the ground bus, to main metallic water service entrances to the building. Connect ground conductors to the main metallic water service pipes by means of ground clamps. Where a dielectric main water fitting is installed, connect the ground conductor to the street side of the fittings. Do not install a grounding jumper around dielectric fittings. Bond the ground conductor conduit to the conductor at each end.

B. Route bond interior metal piping systems and metal air ducts to equipment ground conductors of pumps, fans, electric heaters, and air cleaners serving individual systems.

3.2.4 GROUND

A. Fabricate with 20 feet (60m) of conductor laid lengthwise in excavation for foundation or footings. Install so conductor is within 2 inches (50mm) of the bottom of the concrete. Where base of foundation is less than 20 feet (60m) in length, coil excess conductor at base of foundation. Bond conductor to reinforcing steel at four locations, minimum. Extend conductor below grade and connect to building grounding electrode.
3.3 CONNECTIONS

3.3.1 GENERAL

A. Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

B. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series. Make connections with clean bare metal at points of contact.

C. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps. Aluminum to galvanized steel connections will be with tin-plated copper jumpers and mechanical clamps.

D. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.

3.3.2 EXOTHERMIC WELDED CONNECTIONS

A. Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods and plate electrodes. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

B. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushing and bare grounding conductors.

C. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening valves specified in UL 486A and UL 486B.

3.3.3 COMPRESSION-TYPE CONNECTIONS

A. Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.

3.3.4 MOISTURE PROTECTION

A. Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.
3.4 TESTS

A. Subject the completed grounding system to megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System". Submit test results in accordance with Section 26 08 11 - Testing of Electrical System.

B. Ground/resistance maximum values shall be as follows:
   1. Equipment rated 500 kVA and less: 10 Ohms
   2. Equipment rated 500 kVA to 1000 kVA: 5 Ohms
   3. Equipment Grounds: 25 Ohms

3.5 CLEANING AND ADJUSTING

A. Restore surface features at areas disturbed by excavation and reestablish original grades except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying and other work to their original condition. Include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, or mulching. Perform such work in accordance with Division 2 Section. Maintain disturbed surfaces, restore vegetation and restore disturbed paving as indicated.

END OF SECTION
SECTION 26 05 33.11

RACEWAYS AND CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

A. Electrical raceway and conduit systems.

1.3 RELATED SECTIONS

A. Section 26 00 00 - Electrical
B. Section 26 05 26 - Grounding and Bonding for Electrical Systems

1.4 REFERENCES

A. ANSI/ANSI C80.1 - Zinc-Coated Rigid Steel Conduit
B. ANSI/ANSI C80.4 - Zinc Coated Electrical Metallic Tubing
C. ANSI/ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing
D. ANSI/UL 1 - Flexible Metal Conduit
E. ANSI/UL 5 - Surface Metal Raceways and Fittings
F. ANSI/UL 651 - Rigid Nonmetallic Conduit
G. ANSI/UL 797 - Electrical Metallic Tubing
H. ANSI/UL 870 - Safety Standard for Wireways, Auxiliary Gutters and Associated Fittings
I. ETL PVC-001 - PVC-Coated Rigid Steel Conduit
J. NEMA TC2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80) and Fittings
K. NEMA TC3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing
L. UL 6 - Rigid Metal Electrical Conduit
M. UL 360 - Liquid tight Flexible Steel Conduit
N. UL 467 - Electrical Grounding and Bonding Equipment
1.5 SUBMITTALS

A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements. Included in this section are all raceways and conduit, fittings, wireways, supports for conduit on roof, and labeling used. Provide samples upon specific request. U.L. labels affixed to each item of material.

1.6 DESCRIPTION OF WORK

A. The use of the various raceway systems is restricted to the types and other restrictions of the NEC and the local codes. Use of all such systems shall be verified with the local code authority before use. In the case of questionable or denied use, the contractor shall be required to use a raceway system permitted by the local code at no additional cost.

B. Where conduits pass through beams, outside walls, fire rated walls, or structural members, galvanized steel pipe sleeves shall be provided. The size of these sleeves shall be such as to permit readily the subsequent insertion of conduit of the proper size with adequate clearance for movement due to expansion and contraction. Where conduits pass through outside walls, the inside diameter of the galvanized iron pipe sleeves shall be at least 1/2" greater than the outside diameter of the service pipe. After the conduits are installed, fill the annular space between the conduit and its sleeve with a mastic or caulk. Use packing as required to accomplish this. At fire rated wall penetrations, use fire barrier.

C. Grounding: The installation shall comply with all NEC grounding requirements. See specification section 26 05 26 Grounding and Bonding for Electrical Systems for additional grounding requirements.

D. Exposed surface raceways are specifically not permitted, in new construction. Where a raceway is required, in existing construction, it shall be solid, without knockouts, with hinged cover, placed so that cover is gravity closed.

E. Install complete, separate conduit systems for all electrical systems on this project to include, but not limited to include the following.
1. Electrical power and lighting feeders
2. Electrical power and lighting circuits
3. Isolated ground (computer “clean power”) circuits
4. Control wiring furnished by this contractor
5. Emergency and standby power and lighting circuits
6. Communication systems
7. Other electrical systems

F. Branch circuits shall not be installed in or under the ground floor slab and will not be accepted. The only exceptions being circuits and locations specifically required on the drawings to be in or under the floor slab.

G. Aluminum conduit shall not be installed in direct contact with concrete or masonry construction.

PART 2 PRODUCTS
2.1 CONDUITS AND FITTINGS

2.1.1 MINIMUM SIZES

A. Do not use conduit sized less than 3/4 inch steel, 3/4 inch for PVC conduit, 3/8 inch flexible metal conduit, for lengths not to exceed 72 inches supplying light fixtures.

2.1.2 RIGID METAL CONDUIT. (RSC) (RAC) (IMC)

A. Hot-dipped galvanized rigid steel (RSC), Intermediate Metallic (IMC) with zinc-coated threads and an outer coating of zinc chromate, Rigid Aluminum (RAC) accepted.

B. Fittings:
   1. Malleable iron, either cadmium plated or hot-dipped galvanized. Die cast zinc. Aluminum for aluminum conduit. To be insulated throat at terminations.
   2. Use of set screw or bolt-on connectors and couplings is not accepted.
   3. Use deflection and expansion couplings with bonding jumpers at all expansion joints where required. Steel Clamps.

C. Usage: Where exposed on interior and exterior of buildings including roof. All elbows of PVC conduit. Within or penetrating concrete slabs (RSC only).

2.1.3 PVC COATED RIGID METAL CONDUIT

A. NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6 and ETL PVC-001. The PVC coated galvanized rigid conduit must be ETL Verified to the Intertek ETL SEMKO High Temperature H2O PVC Coating Adhesion Test Procedure for 200 hours.

B. Fittings
   1. Malleable iron. Steel.
   2. Use fittings listed and labeled as complying with UL514B.
   3. Exterior Coating: Polyvinyl Chloride (PVC), minimum thickness of 40 mils.

C. Usage: Damp or wet locations. The stub-up from below grade to above grade

2.1.4 ELECTRICAL METALLIC TUBING (EMT)

A. Galvanized Electrical Steel, Galvanized Thin Wall, or Aluminum Tubing


C. Usage: Concealed in interior walls and ceiling spaces. Exposed only in interior mechanical, electrical rooms, and equipment rooms. Gyms, activity spaces, stages as directed, above 10'-0" A.F.F. where exposed. Installation in or under the floor slab will not be accepted.

2.1.5 RIGID NONMETALLIC CONDUIT (RNC)

A. Schedule 40 heavy wall polyvinylchloride, high impact resistant.

B. Fittings: Solvent weld socket type
C. Usage: Underground, under slabs, all bends to be rigid steel. Do not penetrate slab with PVC. Do not use above slabs, above grade, or exposed. Use long sweep rigid steel 90's and rigid steel from 90's to and above grade.

2.1.6 FLEXIBLE METAL CONDUIT (FMC)

A. Spiral-wound, square-locked aluminum. Spiral-wound, square locked, hot-dipped galvanized steel.


C. Usage:
1. May be used for light fixture whips.
2. May be used for final equipment connections, such as transformers, motors and HVAC equipment.
3. Total length not to exceed 72" above ceiling, 48" exposed below ceiling.
4. Exposed only in interior mechanical or electrical rooms.
5. For renovation work, may be used in existing walls only under the following conditions:
   a. The use of EMT or rigid conduit is not feasible.
   b. Written permission has been obtained from the engineer.
   c. Surface mounted conduit is not desired.
6. Installation in or under the floor slab will not be accepted.

2.1.7 LIQUID-TIGHT FLEXIBLE METAL CONDUIT (LFC)

A. Spiral-wound, square-locked, hot-dipped galvanized steel strip plus a bonded outer jacket of PVC.

B. Fittings:
2. Aluminum - Copper free (1% or less)

C. Usage:
1. Exterior equipment - 5' 0" Maximum length
2. Kitchen equipment - 4' 0" Maximum length

2.1.8 ACCEPTABLE MANUFACTURERS

A. Metallic Conduits: Pittsburgh, Alflex, AFC, Wheatland, Allied, Omega, Spang, and Nepco.

B. Nonmetallic Conduits: Carlon, Sedco, and Can-Tex.

C. PVC Coated Metallic Conduits: Plasti-Bond, Perma-Cote, and KorKap.

D. Fittings: Madison, Hubbell, Raco, Regal, Appleton, Thomas & Betts, Steel City, and ECN Korns.

E. Others: As listed with products.
2.2 WIREWAYS
A. Not less than 16 gauge sheet steel. Cross section dimensions not less than 4 inches by 4 inches, or as noted. ANSI gray epoxy paint over rust-inhibiting prime coat. NEMA rated. Large enclosed surface metal raceway used where conduit is not accessible, or use of conduit is not feasible.

B. Manufacturers: Square D., Hoffman

2.3 METALLIC SURFACE RACEWAYS
A. Not less than 0.04" thickness sheet steel with enamel over rust-inhibiting prime coat, ivory finish, not less than 0.25 square inch cross section.

B. One piece for up to 7 - #12 AWG wire capacity.

C. Two piece for up to 8 - #12 AWG wire or more capacity.

D. Usage: Exposed on existing classroom and public walls where concealment of EMT or FMC is prohibitive, and/or in lieu of rigid metal conduit. Use deep boxes for mounting fire alarm devices.

E. Manufacturers: Wiremold, Tehalit, Mono-Systems, Panduit

2.4 NON-METALLIC SURFACE RACEWAYS
A. Rigid polyvinyl chloride (pvc), ivory finish, not less than .20 square inch cross section. Two piece construction, minimum 5 - #12 AWG wire capacity.

B. Usage: Exposed on existing walls, as noted on drawings, where concealment of EMT or FMC and/or in lieu of rigid metal conduit is prohibitive. Use deep boxes for mounting fire alarm devices.

C. Manufacturers: Tehalit, Wiremold, Hubbell, Mono-Systems, Panduit

2.5 POWER/DATA RACEWAYS
A. Wiremold AL4320 series, two compartment, with isolated ground duplex receptacles and data devices as noted on drawings. Provide all required mounting accessories. Serve raceways from flush outlet boxes mounted behind raceway as required and as directed.

PART 3 EXECUTION
3.1 PREPARATION
A. Place sleeves in the cavities of walls and floor slabs for the free passage of conduits.

B. Set sleeves in place a sufficient time ahead of concrete placement so as not to delay the work.

C. Apply caulking for sleeves through floors and through exterior walls.

D. Be sure that plugs or caps are installed before concrete placement begins.
3.2 INSTALLATION

3.2.1 CONDUITS

A. Metallic conduits must be continuous between enclosures such as outlet, junction and pull boxes, panels, cabinets, motor control centers, etc. The conduit must enter and be secured to enclosures so that each system is electrically continuous throughout. Where knockouts are used, provide double locknuts, one on each side. At conduit terminations, provide insulated throat fittings. Where conduits terminate in equipment having a ground bus, such as in switchgear, and panelboards, provide conduit with an insulated grounding bushing.

B. It is intended to reuse the existing conduits in existing construction, if they prove to be adequate in size and integrity.

C. Install conduit and tubing products as indicated, in accordance with applicable requirements of NEC and the NECA "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended function.

D. Cap open ends of raceways until conductors are installed.

E. Wherever possible and unless otherwise indicated on the drawings, install conduit concealed in walls, partitions and above the ceiling. Install conduit exposed in ceiling area at the structure in electrical rooms, mechanical rooms and other rooms where ceilings are not present or scheduled.

F. In mechanical rooms install conduit to equipment not adjacent to walls, by dropping conduits exposed from overhead.

G. Install conduits parallel and supported on Unistrut or equal trapezes and anchored with split ring hangers, conduit straps or other devices specifically designed for the purpose. Wire ties are not permitted. Do not support conduit from ceiling system supports.

H. Installation of the PVC Coated Conduit System shall be performed in accordance with the Manufacturer's Installation Manual. All clamping, cutting, threading, bending, and assembly instructions listed in the manufacturer's installation guide should be followed To assure correct installation, the installer shall be certified by Manufacturer to install coated conduit.

I. Liquid-tight flexible metal conduit on the roof shall be securely fastened in place by an approved means within 12 inches of each box, cabinet, conduit body, or other conduit termination, and shall be supported and secured at intervals not to exceed 4.5 feet. Flexible conduit cannot lay on roof.

J. Have rigid nonmetallic conduit adequately solvent welded at joints to form a tight, waterproof connection. Run green ground wire in all PVC conduit and extend to ground bus.

K. Run concealed conduit as directly and with the largest radius bends as possible. Run exposed conduit parallel or at right angles to building or other construction lines in a neat and orderly manner. Conceal conduit in finished areas. Branch circuits installed in or under slabs on grade will not be accepted unless noted on drawings. Branch circuits shall be installed below floor slabs above first floor.

Install each entire conduit system complete before pulling in any conductors. Clean the interior of every run of conduit before pulling in conductors.
L. Conduit and raceways shall be suspended from building structure, not from ceiling suspension system.

M. Make bends with standard ells or conduit bent in accordance with the NEC. Make field bends using equipment designed for the particular conduit material and size involved. Bends must be free from dents or flattening. Use no more than the equivalent of four 90-degree bends in any run between terminals and cabinets, or between outlets and junction boxes or pull boxes.

N. Securely fasten and support all conduit runs. Provide required clamps, straps, clips, hangers and brackets. Raceways run in joists shall be secured to joists with clamps at 20’-0” maximum spacing. Raceways run parallel to joists shall be supported by caddy clips (1 inch or smaller) or in unistrut/threaded rods/beam clamps trapeze at 15’-0” centers. Raceways run perpendicular to bottom of joists shall be secured with individual conduit hangers at 10’-0” maximum spacing or unistrut/threaded rods/beam clamps at 15’-0” maximum centers. Raceways supported by straps at walls shall be supported per NEC. Support all raceways within one foot of each box, cabinet, disconnect, bend or other raceway termination.

O. Run flexible conduit to all recessed fluorescent fixtures in accessible ceilings. Do not use more than 4 flexible metal conduits per junction box to supply light fixtures in a location. Do not supply a fixture from another with any Raceway or FMC. Suspend junction boxes and conduits from high roofs with hangers and trapeze.

P. Provide two spare 1 inch conduits stubbed into attic space at flush mounted electrical cabinets.

Q. Provide a Greenlee #431 or equal (240 lbs.) nylon pulling line in conduits in which wiring is not installed under this work, such as telephone, signal, and similar systems. Identify both ends of the line by means of labels or tags reading "Pulling Line".

R. Use expansion-deflection fittings on conduits 2 inches and larger crossing structural expansion joints and on exposed conduit runs where necessary. Provide bonding jumpers across fittings in metal raceway systems.

S. Openings around electrical penetrations of fire resistance rated walls, partitions, floors or ceilings shall be made using approved methods so as to maintain the original fire resistance rating. See NEC 300-21.

3.2.2 WIREWAYS

A. Install wireways, where noted or required. Field apply a 90 percent grey zinc paint coating over cuts or scratches before any other finish is applied.

3.2.3 SURFACE RACEWAYS

A. Install surface raceways, where noted or required. At metallic raceways, field apply a 90 percent zinc paint coating to cuts or scratches before any other finish is applied.

3.2.4 COMMUNICATION SYSTEMS

A. This contractor shall provide all raceways and conduits for all communication systems shown and/or required on the drawings. Communication Systems may include but are not limited to fire alarms, intercoms, telephones, television, security, computer data, antenna and media management.

B. Raceways and conduit requirements shall be coordinated by this contractor with each Communication Systems Contractor and the general contractor.
3.3 COLOR CODING

A. Provide color bands approximately two inches wide, applied at 10 foot centers and at pull box locations.

B. Color Codes:
   1. Fire Alarm System       Red
   2. Voice/Data               Blue
   3. Security System         Green
   4. Media Management        Yellow
   5. CATV/MATV               Black

3.4 LABELING

A. Type: Write-on markers with a laminating portion for protection. The writing portion shall be white in color. The laminate portion shall be clear.

B. Installation:
   1. Install the write-on markers with the protective laminates securely over the write-on markers.
   2. Install and label the write-on markers and laminates on conduits in accessible attic space at 4 to 6 inches above the point where the conduit exits the wall. If a conduit cannot be labeled in this manner, install and label the write-on markers and laminate behind the cover plate of the systems electrical box.
   3. Where a junction box is to be installed for future use, install and label the conduit on the cover plate as outlined above as to the destination of the raceway (i.e. panelboard, fire alarm panel, intercom panel, room name etc.).
   4. Label all boxes in a legible manner.

C. Systems To Be Labeled:
   1. CATV/MATV system
   2. Fire Alarm system
   3. Voice/Data system
   4. Media Management system
   5. Security system

END OF SECTION
SECTION 26 05 33.13

BOXES AND FITTINGS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

A. Outlet boxes
B. Junction boxes
C. Floor boxes

1.3 RELATED SECTIONS

A. Section 26 00 00 - Electrical
B. Section 26 27 26 - Wiring Devices

1.4 REFERENCES

A. ANSI/NEMA Publication No. OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers and Box Supports, and Cast Aluminum Covers.
B. ANSI/UL 514 - Electrical Outlet Boxes and Fittings.
C. NEC 370-23(d)

1.5 DESCRIPTION OF WORK

A. The extent of electrical box and electrical fitting work is indicated by drawings and the requirements of this section.
B. The types of electrical boxes and fittings required for the project include the following:
   1. Outlet boxes
   2. Junction boxes
   3. Pull boxes
   4. Conduit bodies
   5. Floor boxes

1.6 SUBMITTALS

A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements.
B. Include cut sheets of fittings, cover plates, junction boxes, outlet boxes, pull boxes, floor boxes and extension rings. Provide samples upon specific request.
PART 2 PRODUCTS

2.1 OUTLET BOXES

A. Flush Device Boxes
   1. Galvanized steel boxes, with extension rings as required. Use 1½ inch deep by 4 inches long, square or rectangular, unless otherwise noted on drawings.
   2. Provide galvanized steel interior outlet wiring boxes of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices.
   3. In boxes with multiple switches, where the voltage between adjacent switches exceeds 300 volts, provide an enclosure equipped with identified, securely installed barriers between adjacent devices.

B. Exterior or Exposed Device Boxes: Use FS or FD cast boxes with threaded hubs.

C. Interior Lighting Fixture Boxes: Galvanized steel with fixture stud supports and attachments to properly support ceiling and bracket-type lighting fixtures. Provide galvanized steel interior outlet wiring boxes of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides and with threaded holes with screws for securing box covers or wiring devices. 1½ inch deep by 4 inches wide octagonal box, unless otherwise noted.

D. Voice & Data Outlet: Provide back boxes at each voice and data outlet. Communications wiring, device and plate to be provided by communications contractor.

E. Masonry Boxes: Galvanized steel with gang capacity and extension ring covers to match the number of devices installed.

2.2 JUNCTION, PULL AND SPLICE BOXES

A. Galvanized steel boxes conforming to NEC Article 370.

B. Use NEMA 1 type boxes at least 4 inches deep, interior spaces.

C. Use NEMA 3R type boxes at least 4 inches deep, exterior spaces.

D. Use NEMA 4 cast iron type with external recessed flanged cover when cast in concrete.

2.3 MANUFACTURERS

A. Appleton

B. Hoffman

C. Hubbell

D. Keystone

E. Lew

F. Orbit Industries

G. Raceway Components
PART 3 EXECUTION

3.1 OUTLET BOXES

3.1.1 GENERAL

A. Provide all standard boxes, pull junction, wiring device and/or splice boxes for all systems in walls and slabs.

B. All low voltage systems in attic or crawl spaces specified in Division 23 are not included.

C. At all ceiling-mounted receptacle and luminaire (exit light, pendants, linear direct/indirect, etc.) locations, provide a heavy duty dual bar hanger with ceiling ties to support the back box. Provide Cooper Industries BA50F or approved equal with appropriate back box for the application.

3.1.2 FLUSH BOXES

A. Mount all outlet boxes flush within 1/4 inch of the finished wall or ceiling line unless otherwise indicated. Provide knockout closures to cap unused knock out holes where knock out holes have been removed. Install outlets flush with finish walls or ceiling surfaces for concealed wiring.

B. Provide galvanized steel extension rings where required to extend the box forward in conformance to NEC requirements. Attach ring with at least two machine screws. Install electrical boxes and fittings in compliance with NEC requirements and in accordance with the manufacturer’s written instructions and with recognized industry practices to ensure that the boxes and fittings serve the intended purposes.

C. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring. Install blank cover plates, painted to match surrounding, at pull boxes, junction boxes and all others to which no fixture or device is to be attached.

D. Securely fasten outlet boxes in position using clips or other suitable means. Secure boxes rigidly to the substrate upon which they are being mounted. Solidly embed boxes in concrete or masonry. Boxes shall not be permitted to move laterally, or to be supported only by EMT or conduit.

E. Provide plaster rings for all boxes in plastered walls and ceilings.

F. Where more than one switch occurs at the same location, use multiple gang outlet boxes covered by a single plate. Separate switches ganged in one box by a grounded metal barrier where system voltage exceeds 150 volts to ground. Fittings shall be approved for grounding purposes or shall be jumpered with a copper grounding conductor of appropriate ampacity. Leave terminations of such jumpers exposed. Use masonry type boxes with square corners in unplastered tile walls to allow tile to be sawed out neatly around box. Plates shall cover any cracks between box and tile. Use oversize plates where necessary.
3.1.3 LIGHTING FIXTURE BOXES

A. Do not install boxes for suspended lighting fixtures which are attached to and supported from suspended ceilings. Coordinate all lighting fixture outlets with mechanical and architectural equipment and elements to eliminate conflicts and provide a workable neat installation. Install approved 3/8" fixture studs in outlets from which lights are suspended, fastened through from back of box. Anchor outlet boxes and particularly those supporting fixtures, securely in place in an approved manner. Support outlet boxes and fixtures from building structures, not from ceiling material. Provide yokes, channels, studs or other supporting materials as required.

B. At all exit luminaires installed in grid ceilings (T-grid), provide a Cooper Industries BA50F or approved equal.

3.1.4 WALL MOUNTING HEIGHT

A. Mounting height of a wall-mounted outlet box means the height from finished floor to bottom of box.

B. Where outlets are indicated adjacent to each other, mount these outlets in a symmetrical pattern with all tops at the same elevation.

C. Remove and relocate any outlet box placed in an unsuitable location.

3.1.5 BACK-TO-BACK BOXES

A. Do not connect outlet boxes back to back unless prior approval from Engineer is obtained.

B. Where such a connection is necessary to complete a particular installation, fill the voids around the wire between the boxes with sound insulating material.

3.1.6 BOX OPENINGS

A. Provide only the openings necessary to accommodate the conduits at each individual location.

3.2 JUNCTION, PULL AND SPLICE BOXES

3.2.1 INSTALLATION

A. Install boxes as required to facilitate cable installation in raceway systems.

B. Provide boxes in conduit runs of more than 100 feet or as required in Division 26.

C. Locate boxes strategically and make them of such shape to permit easy pulling of wire or cables.

D. Locate exposed pull or junction boxes subject to the owner's representative's approval. Protect boxes in such a manner as to prevent foreign material, such as plaster, from entering boxes. Boxes shall be thoroughly cleaned of foreign materials before pulling conductors.

E. Install and support boxes per NEC 314-23 as required and as directed.

3.2.2 COVERS

A. Provide boxes so that covers are readily accessible and easily removable after completion of the installation.
B. Include suitable access doors for boxes above suspended ceilings.

C. Select a practical size for each box and cover.

D. Label covers with permanent “black” felt-tip marker. Circuit numbers shall be provided on power covers.

E. Spray paint fire alarm covers red.

3.3 POWER AND COMMUNICATIONS FLOOR BOXES:

A. Provide and install all wiring, devices, back boxes, covers, plates, conduit and hardware as required for a complete installation. Do not daisy-chain floor boxes with conduits unless otherwise noted on drawings. See Section 26 27 26 for wiring devices to go in floor boxes.

1. Wiremold RFB2-SS. Provide and install one duplex isolated-ground outlet and associated wiring per general notes on drawings. Provide power to outlet using circuit shown on plans. Provide one 1” conduit from this box to nearest wall and then up to accessible attic space for power. Provide one 1-1/4” conduit from this box to nearest wall and then up to accessible attic space for data and telecommunications wiring.

2. Wiremold RFB4-SS. Provide and install two duplex isolated-ground outlets and associated wiring per general notes on drawings. Provide power to outlets using circuits shown on plans. Provide one 1” conduit from this box to nearest wall and then up to accessible attic space for power. Provide one 1-1/4” conduit from this box to nearest wall and then up to accessible attic space for data and telecommunications wiring.

3. Wiremold RFB6-OG. Provide and install three duplex isolated-ground outlets and associated wiring per general notes on drawings. Provide power to outlets in equal groups using circuits shown on plans. Provide two 1” conduits from this box to nearest wall and then up to accessible attic space for power. Provide two 1-1/4” conduits from this box to nearest wall and then up to accessible attic space for data and telecommunications wiring.

4. Wiremold RFB9-OG with RFB119 pan, if required. Provide and install six duplex isolated-ground outlets and associated wiring per general notes on drawings. Provide power to outlets in equal groups using circuits shown on plans. Provide three 1” conduits from this box to nearest wall and then up to accessible attic space for power. Provide three 1-1/4” conduits from this box to nearest wall and then up to accessible attic space for data and telecommunications wiring.

5. Wiremold RFB11-OG with RFB119 pan, if required. Provide and install seven duplex isolated-ground outlets and associated wiring per general notes on drawings. Provide power to outlets in equal groups using circuits shown on plans. Provide three 1” conduits from this box to nearest wall and then up to accessible attic space for power. Provide four 1-1/4” conduits from this box to nearest wall and then up to accessible attic space for data and telecommunications wiring.

3.4 LOCATION OF BOXES

A. The approximate location of boxes for switches, light outlets, power outlets, etc. is indicated on the plans. These drawings, however, may not give complete and accurate information in regard to locations of such items. The exact locations shall be determined by reference to the general building plans and by actual measurements during construction of the building, subject to the Architect’s approval.

B. The Owner’s representative reserves the right to make reasonable changes, up to six feet, in the indicated locations before work is roughed in, without additional charge.
C. Unless otherwise shown or specified, install boxes for switches 44” and receptacles 18” above finished floor. Verify all door swings with the drawings and schedules and locate switches and pull stations, unless specifically noted otherwise, on the strike side of the door. If switch is indicated on hinged side of door, verify location with the Owners Representative.

D. Where shown near doors, install wall switches shall be ganged in multiples as required covered by a single multigang cover plate. Where convenience outlets, telephone outlets, or data processing equipment outlets are near each other, outlet boxes shall be joined or otherwise placed so that they are all the same level. Device plates shall match for all outlets.

END OF SECTION
SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

1.1.1 SECTION INCLUDES

A. Identification required for electrical systems.

B. Code required identification not shown on plans nor specified herein shall be provided.

1.1.2 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Division 26, Section 26 00 00, apply to this Section.

B. See the following sections for related work.
   1. Section 26 00 00 - Electrical
   2. Section 26 00 90 - Electrical Submittal Procedures
   3. Section 26 24 16 - Panelboards For Distribution Switchgear
   4. Section 26 28 16 - Enclosed Safety Switches and Circuit Breakers

1.2 SUBMITTALS

1.2.1 PRODUCT DATA

A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1 and Division 26, Section 26 00 90 requirements.

B. Submit product data for sign materials. Refer to Electrical Identification detail on drawings for additional information.

1.2.2 QUALITY ASSURANCE/CONTROL SUBMITTALS

A. After the owner’s room number list is finalized, submit a list of all electrical identification tags. The list shall include the actual text that will appear on each tag. Include the owner’s and architects room numbers on all tags. This list shall be submitted for the review of the owner and architect.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sign Materials:
   1. Type:
      a. Engraving-Stock
      b. Melamine plastic laminate
   2. Thickness:
      a. Less than 25 square inches:
         (1) 1/16 inch
b. 25 square inches or more:
   (1) 1/8 inch
3. Color: Black Conform to FS L-P-287

B. Lettering:
   1. Style: Engraved standard print, unless otherwise indicated.
   2. Size: 3/16 inch to 1/4 inch
   3. Color: White

2.2 SIGN INFORMATION:

A. Panelboard (New):
   1. Data:
      a. Panelboard designation
      b. Voltage, phase and wires
      c. Source of service
   2. Example:
      a. CHAC
      b. 277/480V., 3-phase, 4-wire
      c. fed from MDP

B. Switchboard:
   1. Data:
      a. Switchboard designation
      b. Source of service
      c. Panel type
      d. Style
      e. Amperage
      f. Neutral amperage
      g. Voltage of each branch circuit designation.
      h. Phase and wires.
   2. Example:
      a. DPC – 277/480V.
      b. 3 phase
      c. 4 wire
      d. fed from MDP

C. Safety Switches:
   1. Data:
      a. Switch or load served designation.
      b. Voltage and phase.
   2. Example: In the following example, the text in parenthesis does not go on the actual tag.
      It is for clarification only.
      a. #112 (Owner's Room Number)
      b. A/C #C206 (Architect's Room Number)
      c. Circ. CHAC-15
      d. 480V.
      e. 3 phase

D. Time Clocks:
   1. Data:
      a. Time clock load(s) served
      b. Voltage and phase
      c. Source of service
   2. Examples:
      a. Parking Lot Lights
Identification for Electrical Systems

E. Soffit Lights
   1. 277V.
   2. Fed from CH-21

F. Water Heater:
   1. 208V.
   2. Single phase
   3. Fed from AL2-25

G. Electrical Riser Diagram Signs:
   1. Material:
      a. Provide laminated copy of electrical riser diagram and screw to wall in each
         electrical room.
   2. Size:
      a. Minimum: 12" x 17"
      b. Maximum: 30" x 42"
   3. Provide a riser diagram in each electrical room similar to the riser diagram shown on the
      plans, and/or as required for the area served.

H. Device Engraving:
   1. Any switch for load that is not in sight of the equipment served: custom engrave on outside
      of switch cover plate.
   2. Custom engrave switch function when called for on the plans.

I. Panelboard Directory:
   1. For each panelboard, provide a directory-frame mounted inside the door with heat-
      resistant transparent face and a directory card for identifying the load served.
   2. Identify circuits by equipment served on by room numbers where room numbers exist.
      Room numbers shall be as directed by Owner.
   3. Verify nomenclature at job site.
   4. Directory shall be typed, shall coordinate with panel breaker and be neat.
   5. Indicate spares and spaces with erasable pencil.

J. Refer to Section 26 24 16 (Panelboards for Distribution Switchgear).

K. Nameplate Fasteners:
   1. Securely attach nameplates to equipment with non-corroding stainless steel screws.
   2. Non-corroding pop rivets are acceptable.
   3. Stick-ons or adhesives will not be allowed.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate with the architect to obtain a list of the finalized owner’s room number list.
B. Prepare the quality control submittal of tag data as described in the Submittals article of this
   specification.
C. After the submittal has been reviewed without comment by the architect and the owner,
   proceed to order the identification tags.
D. Tags with incorrect data that have not been reviewed without comment by the architect and owner do not comply with these specifications.

3.2 INSTALLATION

A. Provide signs for equipment requiring identification as shown on drawings and for equipment as required by National Electric Code.

B. Provide for each main disconnect not grouped together.

C. Refer to Section 26 28 16 for Enclosed Safety Switches and Circuit Breakers.

D. Install signs on outside of cover for safety switches and time clocks.

E. Install signs on outside top, not on door, and at each circuit for panelboards, switchboards and motor control centers.

F. Label spares and blank spares in light, erasable pencil.

G. Mount in an easily visible location.

H. All labeling identification shall contain both the owner’s and architect’s room names and numbers. Coordinate with General Contractor to secure construction room numbers.

I. Provide all additional signage required by local authority at no cost to the Owner.

END OF SECTION
SECTION 26 08 11

TESTING OF ELECTRICAL SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

A. Complete testing and evaluations to assure that the electrical system is installed for proper operation.

1.3 RELATED SECTIONS

A. Section 26 00 00 - Electrical
B. Section 26 05 26 - Grounding and Bonding for Electrical Systems
C. Section 26 27 26 - Wiring Devices

1.4 REFERENCES

A. Biddle Instruments #21-P8a - Electrical Insulation Testing
B. Biddle Instruments #25Ta - Earth Resistance Testing

1.5 COORDINATION

A. Coordinate special tests and/or equipment start-up as specified or implied in related sections.

1.6 SUBMITTALS

A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements. Included in this section are megger tests of all main feeders to all switchboards and/or panelboards. Submit tests of insulation resistance, conductor resistance, and ground resistance.

PART 2 PRODUCTS

A. Not used.

PART 3 EXECUTION
3.1 TESTING

A. Perform in accordance with manufacturer’s printed testing procedures, applicable industry standards, ANSI standards, IEEE standards, NEMA standards and as directed by the Engineer. Provide testing equipment in good working order and which complies with the applicable industry standards and manufacturer’s requirements. Include a list of testing equipment used and date of last calibration.

B. Test the following:
   1. Feeder conductors from switchboard to panelboards.
   2. Grounding of the Electrical system neutral: Ground resistance shall not exceed 10 ohms.
   3. Equipment grounds for each feeder: Ground resistance shall not exceed 25 ohms.
   4. Grounds for each transformer: Ground resistance shall not exceed 25 ohms.
   5. Insulation resistance: Ground resistance shall not be less than one (1) megohm.

C. Perform all tests in the presence of the Engineer, Architect or the Owner in accordance with the forms included in this section.

D. Submit each test form within ten (10) working days from the time the test is performed.

E. Document all test results and provide a signed report by the testing technician as witnessed. Reports shall include date, time, weather conditions, field conditions, test data, instruments used and brief description of the test. Include reports in operating manuals. Submit tests.
Job Name: ___________________________________________

Person and Company Conducting Test: __________________________

Signature of Person Conducting Test: __________________________

**Insulation Test Results (Megger)**

<table>
<thead>
<tr>
<th>Feeder Description</th>
<th>Test Date</th>
<th>Resistance (megohms)</th>
<th>Remarks</th>
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Notes:
1. Test shall be conducted after conductors are pulled.
2. Ground resistance on insulation shall be no less than one (1) megohm.
3. Make copies of this form if more blanks are needed.
Job Name: ________________________________

Person and Company Conducting Test: ________________

Signature of Person Conducting Test: ________________

### Transformer Test Results

<table>
<thead>
<tr>
<th>Transformer</th>
<th>Test Date</th>
<th>Secondary Voltage</th>
<th>Tap Setting</th>
<th>Grounding of Transformer Neutral (ohms)</th>
<th>Remarks</th>
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**Notes:**
1. Test on transformer neutral and tap settings shall be performed at time of substantial completion.
2. Ground resistance of transformer neutral shall be no greater than ten (10) ohms.
3. Make copies of this form if more blanks are needed.
Job Name: ___________________________________________

Person and Company Conducting Test: __________________________

Signature of Person Conducting Test: __________________________

**Feeder Ground Test Results**

<table>
<thead>
<tr>
<th>Feeder</th>
<th>Test Date</th>
<th>Resistance (ohms)</th>
<th>Remarks</th>
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**Notes:**
1. Test shall be conducted at time of substantial completion.
2. Ground resistance shall not exceed 25 ohms.
3. Make copies of this form if more blanks are needed.
Job Name: ________________________________

Person and Company Conducting Test: ____________________

Signature of Person Conducting Test: ____________________

**System Neutral Ground Test Results**

<table>
<thead>
<tr>
<th>Feeder</th>
<th>Test Date</th>
<th>Unbonded resistance (megohms) see note 1</th>
<th>Bonded resistance (ohms) see note 2</th>
<th>Remarks</th>
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</table>

Notes:
1. Neutral is not bonded to equipment and/or ground at any location. Resistance shall not be less than one (1) megohm.
2. Neutral is connected to ground at transformer only. Resistance shall not exceed 25 ohms.
3. Test shall be performed at time of substantial completion.
4. Make copies of this form if more blanks are needed.

END OF SECTION
SECTION 26 09 41

LIGHTING CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section includes the provision of a lighting control system for the automatic dimming and deactivation of indoor lighting, except for lighting intended for 24-hour operation.

B. This section does not include controls for theater and stage equipment.

C. This section does not include controls for outdoor ball field lighting.

1.2 RELATED SECTIONS

A. Section 26 05 33.11 - Raceways and Conduits for Electrical Systems

B. Section 26 05 53 - Identification for Electrical Systems

C. Section 26 27 26 - Wiring Devices

1.3 REFERENCES

A. NEMA Guide Publication WD 7 Occupancy Motion Sensors Standard

B. 2015 International Energy Conservation Code (IECC)

1.4 DEFINITIONS

A. Motion Sensor – A sensor that detects when an occupant is in a space. This sensor can be wired or configured to be an occupancy sensor or vacancy sensor.

B. Occupancy Sensor – A motion sensor designed or programmed to automatically turn the lighting in a space “on” when an occupant enters the space (based on major motion) and automatically turn the lighting in a space “off” after the occupant is no longer present or detected (based on minor motion) for a predetermined length of time.

C. Vacancy Sensor – A motion sensor designed or programmed to require an occupant to manually turn the lighting in a space “on” and automatically turn the lighting in a space “off” after the occupant is no longer present or detected (based on minor motion) for a predetermined length of time.

D. Dual Technology Sensor – A motion sensor with both infrared and ultrasonic technologies or both infrared and microphonic technologies.

E. Photocell – A light sensitive sensor used to communicate with a room controller to dim the lighting in a daylight zone according to the ambient lighting entering a space via any method other than electric lighting.
F. Room Controller – The local space lighting controller that interfaces with the luminaires, motion sensors, photocells, smart switches, etc. in each space to control on/off, “scenes”, dimming, and daylight harvesting. This may include the power pack, distributed controller, ballast interface modules, interface components, etc. Some or all of this function may be an integral part of the luminaires in the space.

G. Energy Management Control System (EMCS) – May also be called Building Management System (BMS). This system is used to control mechanical systems in the building via PC software.

H. Smart Switch – Intelligent programmable switch capable of communicating with the lighting control system in the space to trigger on/off, “scenes”, dimming, etc.

I. Network Controller – The building-wide controller that connects Room Controllers together into a central network.

J. Daylight Zone – Area in a space around/about a window, skylight or other fenestration measuring how far exterior natural lighting can reach into a space. Not all daylight zones can be combined. Luminaires in a daylight zone are to be controlled separately from the luminaires in the rest of the space. Some daylight zones, after they are identified in a space, will not require any change to the lighting controls already shown and may therefore be disregarded. Those will usually be deleted from the reflected ceiling plans to prevent confusion.

K. Enhanced Building Controls (EBC) – A building interface (digital control system) intended to group all room controllers into a networked lighting control system to allow load shedding, scheduling events, remote programming, remote control via software interface, etc.

L. Functional Testing: Start-up or testing performed by the manufacturer or certified representative to verify the operation of the complete lighting control system.

M. Commissioning Agent: Third party hired by Owner or the design team to meet IECC commissioning requirements.

1.5 DESIGN REQUIREMENTS

A. The system shall include all required devices for a complete and proper operating system to automatically control the lighting to meet the intent of the IECC. The system may include but not be limited to motion sensors, room controllers, enhanced building controls (if required), low voltage control wiring, photocells, smart switches, intelligent luminaires and all required boxes.

B. Sensor design and layout: Provide the quantity of motion sensors required for complete and proper coverage without gaps within the range of coverage of controlled areas. Rooms shall have 100% coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only rooms that are to be provided with sensors. Provide additional sensors if required to properly and completely cover the respective room. Proper judgment must be exercised in executing the work so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components.

C. Not all required components are shown on the plans.

D. A distributed lighting control system is required. Relay panels are not acceptable unless noted on Lighting Control Chart.
E. Battery operated devices and controls are not acceptable.

F. Refer to Luminaire Schedule, Luminaire Controls Detail, Switch Function Detail and Lighting Control Chart for additional requirements and more information.

1.6 PERFORMANCE REQUIREMENTS

A. All Spaces:
1. Refer to the reflected ceiling plans and Lighting Control Chart for additional information and requirements for controlling the lighting in various areas throughout the building. For projects beyond the scope of a single system, multiple systems shall be networked together to accommodate any size requirement.
2. When the fire alarm or security system activates an alarm, the lighting controls shall turn all interior and exterior building-mounted lights on to meet NFPA 101 section 7.8.1.2.2 requirements. This feature shall be provided via contact closure at the fire alarm control panel (FACP) as a trigger to the lighting control system. Provide all associated hardware and wiring from the FACP to the lighting control system necessary for a complete and working system. Refer to Lighting Control Chart for additional information.
3. All portions of the controls mounted above ceiling are to be plenum rated.
4. If a generator or UPS provides backup/auxiliary power to any luminaires, then power shall be provided for all lighting controls in those spaces such that all functions of the lighting control system remain operable under any power condition.
5. If a generator or UPS provides emergency power to any emergency luminaires, all emergency luminaires shall turn on to maximum lumen output. If battery packs provide power for emergency lighting, all emergency luminaires shall turn on to maximum lumen rating of the battery pack.
6. Wiring between sensors and control units shall be 18 AWG minimum (stranded preferred) or CAT5/5e/6. Wiring shall be plenum rated in plenum spaces and UL listed. Pre-terminated low voltage wiring from the lighting controls manufacturer is preferred.
7. See the Sequences of Operation article in this specification section.

B. Motion Sensors
1. All motion sensors are to be corner (preferred) or ceiling mounted except in single toilets or small closets (< 40sqft) or unless otherwise indicated on the drawings.
2. Where allowed, wall-mounted motion sensors shall be suitable for 120v or 277v lighting.
3. All motion sensors shall be dual technology.
4. All motion sensors to be set to a 20-minute time delay and adjusted to maximum sensitivity, unless otherwise noted on the drawings. Must be capable of being set down to 5 minutes and 1 minute for testing.
5. Coverage areas for major motion and minor motion shall be determined in accordance with Section 3 of NEMA WD 7 Guide.
6. Ultrasonic technology shall utilize a frequency that does not interfere with other sensors, hearing aids, smartboards, etc.
7. All motion sensors on this project shall have masking or internal shielding available to control coverage pattern in the field. Stickers or other external adhesive masking will not be accepted.

C. Timer Switches: Where indicated on the plans, a timer switch control function shall have an override not exceeding 2 hours to meet code.

D. Smart Switches
1. The smart switch shall control the luminaires in the space for all on/off, dimming and/or “scene” controls as indicated in the Lighting Control Chart on the drawings.
2. For device color and cover/trim color, see specification section 26 27 26.
3. The smart switch is to be used as a manual override when used with vacancy sensors.
4. Where keyed switches are indicated on the plans, the “off” feature of the smart switch is to be disabled for a schedule similar to 7a-5p. Coordinate exact schedule with Owner.

5. All programmable switches are to be engraved or internally labeled so that the function of each button is clearly identified. All labeling or engraving must be of high quality and be provided by the lighting system manufacturer.

E. Room Controller
1. In the event of a hardware or software or component failure, the lighting in the space is to default to the “ON” position.
2. Provide adequate room controllers in each space for proper operation of the lighting to meet all code requirements and design intent shown on the plans.
3. All room controllers shall utilize zero-crossing circuitry.

F. Network Controller
1. Shall be capable of being programmed/reprogrammed via PC software. It shall be capable of receiving input via contact closure, user PC software, fire alarm control panel, etc. and issuing building-wide commands to enable/disable a scene at all luminaires inside and outside the building.
2. Shall include astronomical time clock capable of seven different day types per week, automatic holiday “shutoff” feature for 24-hours, 12-hour minimum program backup capabilities to meet code.
3. Shall be BTL BACNET listed for use to communicate with EMCS.

G. See Lighting Control Chart on the drawings for controls by space and sequence of operation.

H. If house lighting exists and is controlled by the theatrical lighting control system, the theatrical lighting control system must be able to communicate with the EBC via DMX, contact closure, BACnet or other approved means to allow the EBC to control and dim the lighting for load shedding and reporting.

1.7 PRODUCT DATA

A. Submit product data for all components and accessories of the lighting control system including, but not limited to:
   1. Motion sensors
   2. Photocells
   3. Smart switches
   4. Time switches
   5. Room controllers
   6. Enhanced building controls (if required)
   7. Software
   8. Lighting contactors
   9. Low voltage wiring
   10. Intelligent luminaires

B. Product data for motion sensors shall clearly indicate coverage areas for major motion and minor motion determined in accordance with the testing procedures of NEMA Guide Publication WD 7 Occupancy Motion Sensors Standard.

C. Submit a warranty letter with warranty requirements per this specification including and describing coverage for systems that use multiple product brands to provide a complete system.

D. Any product submitted other than from the manufacturers listed below in Part 2 will be rejected.
1.8 SHOP DRAWINGS

A. Submit shop drawings of each reflected ceiling plan in this project showing the specific locations of all parts of the lighting control system including motion sensors, photocells, smart switches, room controllers, enhanced building controls (if required), etc. Motion sensors shown shall include sensor type, sensor mounting, and other pertinent data to allow evaluation of the proposed system.

B. Submit a wiring diagram for all motion sensors, photocells, smart switches, room controllers, etc.

C. Submit a sequence of operations for each unique space type describing the function of each button on each switch and the effects on the lighting in the space. This sequence of operations should be similar to the Lighting Control Chart with the added information describing how the lighting control system pieces/parts work together.

D. Submit a list of switch types by unique space with a list of proposed button labels. This list should be similar to the Switch Function Detail with added information showing switch button layouts and actual labels for this project.

1.9 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide 2 complete sets of operating, maintenance, and adjustment instructions and other information necessary for proper operation of the lighting control system. These documents shall be included as part of the project operating and maintenance manuals.

B. As-built Drawings: Provide 2 complete sets of as-built reflected ceiling plans showing the location and wiring configuration of all motion sensors, room controllers, photocells, etc.

C. Warranty: Provide 2 copies of warranties.

D. Training Documentation: Provide a letter in the final documents documenting that Owner (give name of person, date, duration, and content of training) received training required in this section.

E. System Functional Testing Documentation: Provide two (2) copies of documentation reporting the manufacturer’s start-up, adjusting, and final testing of the completed installation. Include a list of controllable points to the BMS provider upon completion of lighting controls functional testing.

F. Software Maintenance Agreement: Provide 2 copies of the software maintenance agreement.

1.10 REGULATORY REQUIREMENTS

A. UL Label: All lighting control system products shall be UL-labeled, individually and as a system, for the specific applications utilized on this project.

1.11 MOCK-UPS

A. Provide a product demonstration by the manufacturer of the lighting control system including a sample of each piece and part demonstrating a complete working system. If a product demonstration is not acceptable by Owner or Architect, provide, at additional cost, a mock-up of required space types with complete controls for owner / engineer / construction administration review before installation throughout the building.
1.12 PRE-INSTALLATION MEETINGS

A. Meet with the manufacturer of the lighting controls on-site to review installation, wiring methods and exact equipment locations of all components prior to starting installation. At this meeting Contractor shall be trained by the manufacturer or vendor on the installation, setup and functionality of the system. Failure to have this meeting will result in Contractor assuming full responsibility of all costs incurred to move controls and sensors, replace equipment due to product damage, costs due to installation errors or failure to meet the full intent of the design.

1.13 STORAGE AND PROTECTION

A. Store all product in accordance with manufacturer’s storage requirements.

1.14 WARRANTY

A. Provide a five-year parts and one-year labor warranty on the entire control system. Warranty coverage shall begin at the time of Project Substantial Completion.

1.15 SYSTEM STARTUP

A. Provide the initial programming, aiming and start-up of the system.

B. After system startup and prior to substantial completion of the project, require the manufacturer to test the operation of the complete system (all pieces, every space) to ensure the proper operation of the system throughout the range of building operating conditions. Provide documentation of such functional testing in the closeout submittals. Do this functional testing on all projects, regardless of other additional commissioning or testing requirements.

1.16 OWNER’S TRAINING

A. After functional testing is complete, manufacturer shall provide a minimum of 4 hours of on-site training to Owner’s personnel in the operation, adjustment, and maintenance of the system. Do this training in a location where it can be recorded by Owner. Coordinate date, time and location of training one week prior to meeting and provide documentation of such training in the closeout submittals.

1.17 THIRD PARTY COMMISSIONING

A. In addition to functional testing by Contractor and the manufacturer, additional third party commissioning is required to meet IECC requirements. The manufacturer shall be present during the third-party commissioning process.

1.18 EXTRA MATERIALS

A. In addition to extra materials called for elsewhere in the specifications, include in the base bid:

1. Provide 1 room controllers.
2. Provide 1 motion sensors.
3. Provide 1 smart switches (6 or more buttons).

1.19 MAINTENANCE SERVICE

A. Provide a three-year manufacturer’s software service agreement with the system. The agreement shall cover all minor updates, bug fixes and maintenance to the software of the system to maintain all original functionality. The software service agreement shall start at the time of substantial completion.
1.20 SYSTEM SUPPORT

A. Provide five-year complete system support starting from substantial completion. The entire lighting control system (hardware and software) shall be included in the support. The support shall include phone and email communication (as a minimum) for the duration of the support. The system support shall include all technical support, hardware and software questions, warranty help, etc.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. If they comply with these specifications, products of the following, and only the following, manufacturers will be acceptable:
   1. Acuity Controls - Chris Sears at 214-658-9030
   2. Crestron - Chris Sears at 214-658-9030
   3. Douglas Lighting Controls - Brendan Kenna at 214-247-7415
   4. Eaton Controls - Allen Pilgrim at 817-267-9300
   5. Encelium - Grant Grubb at 214-413-7034
   6. Hubbell Controls - Grant Grubb at 214-413-7034
   7. Intelligent Lighting Controls – Randy Schwimmer at 972-406-8700
   8. Leviton - Grant Grubb at 214-413-7034
   9. Lutron - Allen Pilgrim at 817-267-9300
   10. Philips Controls - Brendan Kenna at 214-247-7415
   11. WattStopper - Grant Grubb at 214-413-7034

B. No other manufacturers will be accepted.

2.2 MANUFACTURED UNITS

A. All parts of the lighting control system shall be warranted by the same company.
B. All parts of the lighting control system shall be from the approved list of manufacturers above.
C. All parts of the lighting control system shall be aesthetically compatible. i.e., from the same product line or family of products.
D. All sensors shall be from the latest release generation. Do not mix product of different releases or generations.

PART 3 EXECUTION

3.1 SITE VERIFICATION OF CONDITIONS

A. If the work is to be performed in an existing facility, visit the site of the proposed work and observe its conditions so that you may be fully informed as to the materials, labor, workmanship and conditions under which the work is to be done. If an existing lighting control system exists, then the new system shall work with the existing system.

B. No allowances shall be made on account of any errors, negligence or failure to be aware of the condition of the existing site.
3.2 INSTALLATION

A. General

1. Provide all lighting controls as required and where indicated, in accordance with manufacturer's written instructions and project shop drawings, applicable requirements of the NEC, and recognized industry practices to ensure that products serve the intended function.

2. Provide the room controller as required located above the ceiling above the switches near the exit door. Provide a permanent label on the ceiling t-grid to identify its location. The label material shall be as described in specification section 26 05 53. The label shall say “Lighting Controller”. It is acceptable for a room controller to serve more than one space.

3. Provide conduit and wiring in accordance with specification section 26 05 33.11.

B. Shop Drawing Preparation: At least five working days prior to bid time, provide a set of floor plan drawings and a copy of these specifications to the manufacturer for the purpose of system layout with quantities and creating shop drawings for the owner. Coordinate with the manufacturer to determine the required medium (hard copy or electronic) and the format required by the manufacturer.

C. Sensor Design and Layout by Manufacturer:

1. Refer to Design Requirements article regarding sensor design and layout.

2. Exact locations of control unit hardware boxes shall be based on observing good installation practice and shall be coordinated with other elements of the reflected ceiling plan. Control unit hardware shall be fully concealed.

3. Select the appropriate type of sensor for complete coverage of each space.

D. Lighting Control Cable Routing and Installation:

1. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical code requirements.

2. Cable pathways, conduit, and cable support systems shall be complete with bushings, de-burred, cleaned, and secure prior to installation of cable.

3. All wiring shall test free from opens, grounds, or shorts. All lighting control cable shall be supported from the building structure and bundled. Do not attach any supports to joist bridging or other lightweight members.

4. Support system shall provide a protective pathway to eliminate stress that could damage the cabling. The lighting control cable shall not be crushed, deformed, skinned, crimped, twisted, or formed into tight radius bends that could compromise the integrity of the cabling.

5. Lighting control cable must not be fastened to electrical conduits, mechanical ductwork/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 with line voltage electrical conductors. Lighting control cables shall not be run loose on ceiling grid or ceiling tiles.

6. 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 luminaires 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.

7. Provide bushings to protect the cable from damage for conduit ends, box openings, and passage through metal studs.

8. Lighting control cables shall be run in bundles above accessible ceilings and supported from building structure. Cabling shall be loosely bundled with cable Velcro hook ties randomly spaced at 30 to 48 inches on center, cable ties shall not be tight enough to deform cabling and shall not be used to support the cabling.
9. Each cable run shall include a three-foot service loop with Velcro hook ties located in the ceiling above each device. This is to allow for future re-termination or repair.

10. Lighting control cable will not be installed in the same conduit, raceway, tray, duct, or track with line voltage electrical cable without a metallic barrier meeting NEC requirements.

11. Maximum cable pulling tension should not exceed 25 pound-force (110 N) or the manufactures recommendation, whichever is less.

12. Any pulling compounds utilized must be approved by the cable manufacturer and shall not degrade the strength or electrical characteristics of the cable.

13. No terminations or splices shall be installed in or above ceilings, other than in designated end point housings.

14. Cable bends shall not be tighter that the manufacturers’ suggested bend radius.

15. Mount all equipment firmly in place. Route cable in a professional, neat and orderly installation.

E. Lighting Control Cable Support

1. Conduit, duct, or track shall be used for lighting control cable in exposed areas.

2. Cable fill shall not exceed the manufacturers’ instructions for each type of support.

3. All conduit, ducts, track, and raceways shall be supported from the structure at industry standard intervals for the size specified, utilizing proper anchoring devices.

4. All vertical supports shall be attached to the building support structure or concrete ceiling with anchors load rated for 100-lbs. minimum. Down rods shall be a minimum of 1/4” diameter. Steel uni-strut cross supports shall be 2” minimum.

F. Bushings

1. Provide a plastic snap in bushing at each box opening, passage through a metal stud, and at the end of all open conduit stubs or sleeves prior to lighting control cable installation to protect the cabling from damage:
   a. Box openings - Thomas & Betts Knockout Bushing Series 3210, or equivalent.
   b. Metal stud passage - Thomas & Betts Twist It Bushing Catalog Number SB1216-SC, or equivalent.
   c. Conduit ends - Thomas & Betts Anti-Short Bushing Series 390 or Tite-Bite Combination Couplings Series 442, or equivalent.

G. J-Hooks

1. Attachments for cabling support shall be spaced at approximately 48 to 60 inches on center. Cable bundles shall not be allowed to sag down more than 12-inches mid-span between attachments.

2. All attachments shall be approved for category rated twisted pair cabling. Attachments shall be Caddy part numbers as follow, or equivalent, sized as follows:
   a. CAT16HP, 1" diameter Capacity 15 Category rated cables.
   b. CAT21HP, 1.31” diameter Capacity 40 Category rated cables.
   c. CAT32HP, 2” diameter Capacity 60 Category rated cables.
   d. Split bundles greater than 2” dia. or provide cable tray.

3. Do not mix different signal strength cables on the same J-Hook (i.e. fire alarm with data and telephone cable). Multiple J-Hooks can be placed on the same attachment point, up to the rated weight load of the attachment device.

H. Cable Tie Wraps

1. Provide and install Panduit TAK-TY cable ties or equivalent.

2. Velcro hook cable ties shall be furnished and installed to attach wire bundles to supports and for appropriate wire management as required.

3. Hard plastic or metal tie wraps will not be allowed on any data grade cable (Category rated twisted pair cable).
3.3 SEQUENCES OF OPERATION

A. Lighting Controls
   1. The smart switch shall be required to be pressed to turn the lights on in all spaces where
      a vacancy sensor is required. Otherwise, an occupancy sensor may automatically turn
      the luminaires on. Two minutes prior to turning the lights off, the lighting controls shall
      dim the luminaires in the space to 50% of their previous output as a notification to the
      occupants that the controls will soon turn the lighting off. A momentary “blink” is allowed
      if luminaires are not dimmable. If the motion sensor is not triggered in two minutes, the
      lighting in the space is to turn off. If the motion sensor is triggered, the lighting controls
      shall dim the lighting back up to the previous lighting level and timeout is restarted. In
      spaces with timer switches, the system shall accept an override signal at any time either
      before or after the lighting is turned off. The occupant shall not be required to wait for the
      lights to go out before issuing the override.
   2. Where shown on the plans, a photocell is to be used to measure the light level and signal
      to the room controller to dim the luminaires continuously (from 100% to 15% or lower,
      including off) in the daylight zone to maintain a consistent (within +10% and -0%) lighting
      level in the space.

3.4 MANUFACTURER’S FIELD SERVICES

A. Coordinate with the sales representative to coordinate the below requirements with the
   manufacturer.
   1. The manufacturer shall provide instruction at the start of the job to Contractor regarding
      the proper installation of the system.
   2. As part of the system startup process, the manufacturer shall provide all initial field
      programming of the system.
   3. Using certified factory representatives, the manufacturer shall inspect the finished
      installation against the shop drawings and installation instructions.
   4. Using certified factory representatives, the manufacturer shall do functional testing of the
      finished installation. Submit documentation of the functional testing in accordance with
      Part 1 of this specification.

3.5 ADJUSTING

A. Motion sensors may be affected by various conditions in the room. It may be necessary for
   Contractor to make adjustments, change the location or type of sensor to obtain proper
   operation in a specific room. Contractor/equipment manufacturer shall have final responsibility
   for proper operation and coverage of the system in each room and should therefore make
   labor allowance for such changes and adjustments. Contractor is also responsible for
   acquiring approval from Engineer for any changes or deviations from project specifications.

B. Work with the manufacturer to correct all findings from manufacturer functional testing.

C. Work with the manufacturer to correct all findings made by the third-party commissioning agent
   or registered design professional, whichever entity performs the commissioning service. This
   contractor is responsible for the entire lighting control system and luminaires to pass the
   commissioning inspection and reporting.

3.6 OWNER’S TRAINING AND DEMONSTRATION

A. Upon completion of testing and adjustment, demonstrate operation of the system to
   representatives of Owner.
B. Instruct Owner's personnel in proper maintenance, adjustment, and operation of the motion sensor lighting controls.

C. Discuss with Owner the time clock feature programming requirements (on/off times and school schedule) and teach them to program the clock feature to match the required schedule.

D. Upon completion of testing and adjustment (commissioning), Contractor and a direct employee of the equipment manufacturer (who is already familiar with the details of the project) shall demonstrate operation, proper maintenance, troubleshooting and adjustment of the lighting control system and all sensors throughout the building. Owner shall receive a minimum of 4 hours and a maximum of 8 hours in an on-site training session. The length of the training session shall be at the discretion of Owner. The training shall cover the following areas in detail:

1. Scope of system: Review the as-built documentation with Owner to detail extent of system. Identify locations of all wall stations, wiring, and panels that fall within the scope of the lighting control system. Define clear lines of scope between lighting control system and EMS functions if applicable.

2. Operation of system: Cover normal operation of switches, push-buttons, LCD interfaces and software (if provided). Provide documentation to Owner showing the operational zoning of controlled circuits and all time-clock events programmed into the Lighting Control System. Show Owner how to change and add/delete events.

3. Maintenance and Troubleshooting of system: Detail any required or optional preventive maintenance actions required of Owner. Go over step-by-step procedures to troubleshoot all possible failure modes of each component type of the lighting control system. Cover procedure to get lights turned on in any space containing a lighting control system in the event the control system fails. Identify any specialized equipment necessary to support all the above actions.

4. Service and Support of system: Identify nearest direct support contact for the manufacturer and provide both telephone and email contact details.

END OF SECTION
SECTION 26 22 13
LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dry-type transformers rated 600 volt and below for general power, computer power, and lighting applications.

1.2 RELATED SECTIONS

A. Section 26 00 00 - Electrical
B. Section 26 00 30 - Warranty Period
C. Section 26 00 90 - Electrical Submittal Procedures
D. Section 26 05 26 - Grounding and Bonding for Electrical Systems
E. Section 26 05 33.11 - Raceways and Conduits for Electrical Systems
F. Section 26 05 33.13 - Boxes and Fittings for Electrical Systems
G. Section 26 28 16 - Enclosed Safety Switches And Circuit Breakers

1.3 REFERENCES

A. UL 5085-1 Low Voltage Transformers - Part 1: General Requirements
B. UL 5085-2 Low Voltage Transformers - Part 2: General Purpose Transformers
C. ANSI - C33.4/C57.96
D. NEMA-ST-20 Dry Type Transformers for General Applications
E. IEEE 45
F. CODE OF FEDERAL REGULATIONS, Title 10 Energy, Part 431 Energy Efficiency Program for certain commercial and industrial equipment (10 CFR Part 431)
G. UL 1561 – Standard for Dry-Type General Purpose and Power Transformers

1.4 SYSTEM DESCRIPTION

A. Equipment items specified by manufacturer’s name, brand name or catalog number are the specific items upon which the electrical system design is based.
B. Proposed substitute equipment shall be evaluated for design compatibility as well as for electrical and physical equality.
C. Provide transformers of capacity required per NEC required overload protection on primary and secondary sides. Primary and secondary conductors shall be sized in accordance with the NEC.

1.5 SUBMITTALS

A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1 and Division 26, Section 26 00 90 requirements.

B. Product Data: Submit product data for the following:
   1. Submit transformer cut sheets, shop drawings, and other pertinent data during submittal phase with other switchgear.
   2. Submit test data, after installation, with records for Owner manuals.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The following are approved manufacturers.
   1. Eaton Corporation (formerly Cutler-Hammer)
   2. General Electric
   3. Square D

B. All other manufacturers shall require pre-approval in accordance with specification section 26 00 00.

2.2 MANUFACTURED UNITS

A. Ventilated transformers shall be UL 1561 listed.

B. Insulation rating: Class 155 or higher.

C. Temperature rise: Maximum temperature rise to be 150°C over 40°C ambient. Reduced temperature rise to be 80°C or 115°C only where noted on drawings.

D. Load Rating: Capable of operating at 100% of nameplate rating continuously on 150°C rise, 115% on 115°C rise and 130% on 80°C rise while in an ambient temperature not exceeding 40°C. Design transformers for continuous operation at rated KVA, 24 hours per day, 365 days per year with normal life expectancy as defined in IEEE 65.

E. Sound Rating: Audible sound levels shall be in accordance with NEMA ST-20.

F. Energy Efficiency: All ventilated transformers rated 15 kVA and above covered by this specification section shall meet the minimum energy efficiency levels set forth in 10 CFR Part 431. Sealed and non-ventilated transformers are exempt from 10 CFR Part 431. Dry type transformers below 15 kVA are exempt from 10 CFR Part 431. Submittals shall clearly indicate compliance with 10 CFR Part 431.

G. Coils: Continuous wound copper construction impregnated with non-hygroscopic varnish.

H. Tap arrangement: Use in the high voltage winding unless noted otherwise on the drawings. Provide taps as follows.
   1. 3 KVA Through 25 KVA: 4 at 2.5% each, 2 above and 2 below nominal voltage
   2. 30 KVA Through 112.5 KVA: 6 at 2.5% each, 2 above and 4 below nominal voltage
   3. 150 KVA Through 500 KVA: 6 at 2.5% each, 2 above and 4 below nominal voltage
I. Cores: Constructed of high grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Bolt completed core and coil to the base of the enclosure and isolate by means of vibration-absorbing mounts. Metal-to-metal contact between the core and coil and the enclosure is not permitted. Visibly ground the core of the transformer to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.

J. Transformer Enclosures: Fabricate all transformer enclosures of heavy gauge, sheet steel construction. Ventilate all enclosures. Maximum temperature of the top of the enclosure: 50°C rise above a 40°C ambient. Provide a UL recognized coating for outdoor use.

K. Color: ANSI 61 or 49 gray. Apply uniform coating to all edges and surfaces.

L. Non-Linear transformers: K13 or K20 with 200% neutral bar.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide K13 transformers when serving isolated ground electrical panels.

B. Provide K20 transformers when serving electrical panels in major network operations centers (NOC).

C. Mount transformers on additional vibration isolators and/or on rubber and spring isolators at floor or other mounting points to meet sound ratings. Install as per manufacturer's recommendations and/or Engineer's directions. Isolators are in addition to isolators shipped with transformers from the manufacturers.

D. Install the transformer so that vibrations are not transmitted to the structural parts of the building. Mounting should be on a solid wall, floor, or other wall, floor, or other structure with solid mass. Mounts must be isolated and properly loaded avoiding direct contact with other metal structures. Isolate the transformer by using flexible couplings and conductors to help prevent vibrations being transmitted to other equipment. Make sure shipping braces and hold-down bolts are loosened as specified by the manufacturer's installation manual. Ventilated transformers should "float" on vibration dampening pads located between the enclosure and the core and coil assemble.

E. Exterior weatherproof transformers: Mount on 6" thick minimum steel reinforced concrete slab. Extend slab 1'-0" beyond transformer on each side. Provide weather shields from the manufacturer.

F. Install transformers as indicated, complying with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to ensure that products fulfill requirements.

G. Coordinate transformer installation work with electrical raceway and wire/cable work, as necessary for proper interface.

H. Set transformer plumb and level. Use flexible conduit, 6 ft. maximum length, for connections to transformer. Make conduit connections to side panel of enclosure.

I. Check for damage and tight connections prior to energizing transformer. Measure primary and secondary voltages and make appropriate tap adjustments.
3.1.1 SITE TESTS, INSPECTION

A. Apply standard potential, loss ratio, polarity and continuity tests to each transformer.

B. Provide the test data results for each transformer. Provide certification of test data accumulated on similar units to show the expected values of sound levels, temperature rise, full-load losses, regulation and impedance.

END OF SECTION
SECTION 26 24 16

PANELBOARDS FOR DISTRIBUTION SWITCHGEAR

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

A. Switchboards
B. Branch circuit panelboards
C. Switchgear

1.3 RELATED SECTIONS

A. Section 26 00 00 - Electrical
B. Section 26 05 26 - Grounding and Bonding for Electrical Systems
C. Section 26 05 33.11 - Raceways and Conduits for Electrical Systems
D. Section 26 22 13 - Low Voltage Distribution Transformers
E. Section 26 28 13 - Fuses

1.4 REFERENCES

A. UL 50 - Cabinets and Boxes.
B. UL 67 - Electric Panelboards.
C. NEMA AB1 - Molded Case Circuit Breakers.
D. NEMA AB2 - Procedures for Verifying the Performance of Molded Case Circuit Breakers.
E. NEMA PB1 - Panelboards.
F. NEC – NFPA 70 National Electrical Code 2017

1.5 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

A. For any project where service entrance equipment is added or changed, provide a short circuit/coordination study for the entire system.

B. For any project where electrical panels are added or changed but the service entrance equipment is not changed, provide a short circuit/coordination study for the service entrance equipment and the affected panels.
C. For any project involving mechanical equipment changes including chillers, cooling towers, air
Handlers, condensers, pumps, or rooftop units, provide a short circuit/coordination study for
the affected portion of the system including affected panels and branch circuit overcurrent
protective devices.

D. Submit the short circuit/coordination to the city. The level of detail and format shall conform
to city requirements.

E. Coordinate the short circuit current ratings of mechanical equipment with the available short
circuit current. The short circuit current ratings of all electrical and mechanical equipment shall
exceed the available short circuit current.

F. Adjust settings of adjustable circuit breakers to achieve selective coordination of the system.
Notify the engineer if selective coordination cannot be achieved.

1.6 DESCRIPTION OF WORK

A. All panelboards with 400 amp main circuit breakers, 400 amp main lugs or 400 amp fused
and larger shall be factory assembled.

B. The Contractor shall furnish and install approved panelboards of the types indicated and
specified herein at locations as shown on the drawings.

C. Interiors shall be completely factory assembled.

D. Panelboard schedules on the drawings, shall govern where this specification is in conflict with
panelboard schedules.

1.7 SUBMITTALS

A. Submittals required in this section shall conform to and be submitted in accordance with the
General Conditions, Division 1, and Division 26, Section 26 00 90 requirements.

B. Provide shop drawings for each electrical equipment room showing the placement of all
panelboards, transformers, and other equipment such as mechanical equipment, drawn to
scale and dimensioned. Such shop drawings will be reviewed for compliance with the intent
of the contract drawings and the spaces available for the electrical apparatus.

C. Clearly indicate on the submittals whether equipment is fully rated or series rated.

D. Arrangement: Arrange panelboard submittals in the order the panelboard schedules appear
on the panelboard sheets of the drawings as read from top to bottom, then left to right.

PART 2 PRODUCTS

2.1 ENCLOSURE

A. Minimum 16 gauge cold-rolled sheet steel. Gutter wiring space shall be a minimum of 4 inches
on each side/industry standard. Provide standard conduit knockouts in ends and sides of
cabinet. Provide flush type combination catch and key door locks on all panelboards and load
centers. Key all locks alike, provide two keys with each panelboard.

B. Flush mounted panelboards trims shall fasten to permit both horizontal and vertical
adjustment.
C. Surface mounted panelboards trims shall fasten to insure no overhang.

D. Bus Material shall be:
   1. Phase Bus: 98% IACS conductivity copper with rounded edges, tin electro-plated.
   2. Ground Bus: 25% phase rated, additional isolated bus in computer and communication panels.
   3. Neutral Bus:
      a. 200% of phase rated copper, tin electro-plated - computer panels
      b. 100% of phase rated copper, tin electro-plated - lighting and power panels
   4. Current density to be the industry standard.

E. Install in allotted spaces so that devices can be added without additional machining, drilling or tapping.

F. Brace to withstand symmetrical short circuit current as indicated on drawings.

2.2 CIRCUIT BREAKERS


B. All switchgear bolt-on only. Number of poles and ampere ratings indicated for the specified service.

C. Interrupting Ratings: As indicated on panel schedules. Panels may be noted on the drawings as fully rated due to excessive motor loads. Otherwise, panels can be fully rated or series rated for construction of new buildings. For addition and renovation work, panels with main breakers can be fully rated or series rated unless noted on the drawings as fully rated. Main lug only panels for addition and renovation work shall be fully rated.

D. Bimetallic overload elements. Magnetic trip. Common trip type so that an overload or fault on one pole will trip all poles simultaneously. Handle ties are not acceptable.

E. Connect to the main bus by means of a solid connection. Use breakers which are capable of being operated in any position within the panel.

F. Independently mount so that a single unit can be removed from the front of the panel without disturbing or removing main bus, other units or other branch circuit connections.

G. Provide ground fault breakers (GFCI) where indicated on the schedules and/or as required by N.E.C.

H. Provide HACR listed circuit breakers on all HVAC equipment 60 amps or less.

2.3 CIRCUIT IDENTIFICATION

A. Frame-mounted directory with a heat-resistant transparent face for identifying circuits. Use equipment names as reflected by Engineer. Use numbers selected by the Owner, which may differ from those shown on plans.

B. Indicate with light, erasable pencil marking, all spares and spaces.

C. Provide on all panelboards, revise existing panelboards per Division 26 with new information.

D. Mount inside the panelboard door.
2.4 IDENTIFICATION OF SWITCHGEAR

A. Information shall include the following:
   1. Panel type
   2. Style
   3. Amperage
   4. Neutral amperage
   5. Panel voltage
   6. Phase
   7. Number of wires

B. Provide information on each piece of equipment, on factory or contractor made nameplate.

C. Series Rated Panels: In accordance with NEC Article 240.86(B), provide a label affixed by the manufacturer indicating the tested and approved series rating combinations. Provide an additional label affixed behind the panel door to be field marked in accordance with NEC Article 110.22(C).

2.5 MANUFACTURERS

A. General Electric

B. Square D

C. Eaton Corporation (formerly Cutler-Hammer)

PART 3 EXECUTION

3.1 INSTALLATION

A. When isolated ground devices are shown being powered from a panel, provide a complete isolated ground system including isolated ground panel with 200% neutral, SPD and separate isolated ground bus.

B. Install in the locations as shown and as recommended in NEMA PB1.1. Mount the panelboards such that the center of the switch or circuit breaker in the highest position will not be more than 6-1/2 feet above the floor or working platform. Space all panelboards and switchboards to meet the requirements of Article 110 and 340 of the N.E.C. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secured.

C. Provide required SPD breaker for each panel-switchboard as required by the manufacturer.

D. Provide a sign at each switchboard 1600 amp and greater, which reads "Danger High Voltage" in red/white/black.

E. Install panelboards and enclosures, including electrical connections, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the NECA "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended function.

F. Coordinate installation of panelboards and enclosures with cable and raceways installation work.
G. Connect A, B and C phases respectively to bus number 1, 2 and 3 from left to right or top to bottom. Balance panels by checking each phase of all panels under full load and arrange so that all phases carry the same load as near as possible.

H. Furnish and install an engraved laminated nameplate for each circuit breaker or fused switch in distribution panelboards. Refer to electrical equipment identification section of the specifications. Place free standing or floor mounted equipment on housekeeping pads.

I. Series rated panels: Field mark the factory furnished label in accordance with NEC Article 110.22(C).

3.2 INSTALLATION OF CONDUCTORS

A. More than one conductor shall not be installed in any termination in a panelboard unless the termination is marked as suitable for more than one conductor.

END OF SECTION
PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

A. AC Switches
B. Receptacles
C. Connectors
D. Finish plates
E. Relays

1.3 RELATED SECTIONS

A. Section 26 00 00 - Electrical
B. Section 26 05 26 - Grounding and Bonding for Electrical Systems
C. Section 26 05 33.13 - Boxes and Fittings for Electrical Systems

1.4 REFERENCES

A. ANSI/UL 20 - General - Use Snap Switches
B. ANSI/UL 498 - Electrical Attachment Plugs and Receptacles
C. UL 943 – 2006 – Ground Fault Circuit Interrupters
D. NEMA WD 1 - General - Purpose Wiring Devices
E. Applicable Federal Specifications - WC - 596-F, WS-896E
F. Mounting heights per Americans with Disabilities Act

1.5 SUBMITTALS

A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements.

B. Product Data: Clearly mark product data for each product specified and/or proposed for use.
   Product data shall include, but not limited to the following:
   1. receptacle devices
   2. switch devices
   3. isolated ground receptacle devices
1.6 DESCRIPTION OF WORK

A. Provide factory fabricated wiring devices of the type and electrical rating for the service indicated, provide proper selection to fulfill the wiring requirements. Wiring devices, including receptacles and switches shall be colored to match wall plates. Special purpose outlets shall be of appropriate color.

B. Provide a compatible receptacle for the cap or plug and cord of all other equipment installed in this project.

C. Relays, if any, shall be multipole, mechanically held, 30 amperes 120V operating coil, 600V contacts, auxiliary contacts as required for two wire operation, coil clearing contacts; Zenith ESS Series or equal.

D. Provide switch, receptacle, outlet, conduit, and special purpose wall plates for wiring devices, with ganging and cutouts as indicated, provided with metal screws for securing plates to devices, screw heads colored to match finish of plate.

E. Provide oversize plates where required to completely cover wall opening. Where oversize plates are used, all plates in room shall be oversize style.

F. Use plates and Raco narrow gang boxes in storefront mullions and where narrow boxes are required.

G. Mount all switches, thermostats, etc. at the same height when located horizontally within 6 feet on same wall. See mechanical drawings for thermostat locations.

PART 2 PRODUCTS

2.1 AC SWITCHES

A. Quiet-type, commercial, specification grade, back and side-wired with grounding terminals. Furnish AC switches which comply with NEMA WD-1 Standards, UL20 and Federal Specification WC896. Special purpose switches shall be of appropriate color. Switches shall be rated for 120-277 volt AC, number of poles as required.

B. Provide 120/277 volt NEMA 5-20 self-grounding specification grade devices only.

C. Provide 20 ampere ratings for all loads. Rated amperage capacity shall be 100% for all lighting loads, and 80% for all motor loads.

D. Single Pole:
   1. Leviton 1221-S
   2. Hubbell CS1221
   3. P&S CSB20AC1

E. Double Pole:
   1. Leviton 1222-S
   2. Hubbell CS1222
   3. P&S CSB20AC2
F. Three Way:
1. Leviton 1223-S
2. Hubbell CS1223
3. P&S CSB20AC3

G. Four Way:
1. Leviton 1224-S
2. Hubbell CS1224
3. P&S CSB20AC4

H. Keyed switches:
1. Two-prong keys only. Single-prong keys will not be acceptable.
2. Provide 25 extra keys

I. Special Purpose Switches:
1. Quiet-type, industrial specification grade, 120-600 volt AC, number of poles as required.
2. Security Keyed Switch: Leviton 1221-KL; P&S PS20AC1L
3. 20A. 2P Motor: 20AC2-HP (6806U-DAC); P&S PS20AC2HP
4. 30A. 2P Motor: 30AC2-HP (6808U-DAC); P&S PS30AC2HP
5. 30A. 3P Motor: 7803 (7810-UO); P&S 7803MD

J. Wall timer Switches:
1. Watt Stopper TS-400 with optional flash warning
2. Equals by P&S RT24 series.
3. Paragon will not be accepted.

2.2 RECEPTACLES

A. Furnish receptacles which comply to NEMA WD-1 Standards, UL 498 and Federal Specification WC596F.

B. 125 volt Nema 5-20R duplex, side wired, self-grounding with ground lug, specification grade hard use

C. 20A. Duplex: Leviton 5362-S; P&S 5362

D. GFCI Receptacles: 20-amp, duplex. Comply with NEMA WD 1, NEMA WD 6, UL 498, Federal Specification W-C-596, and UL943, Class A. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:
1. Pass & Seymour: 2097, 2097 (NAFTA Compliant), PT2097 (use with PTRA6STRNA prewired pigtail connector), PT2097NA (NAFTA Compliant - use with PTRA6STRNA prewired pigtail connector).
2. Equivalent by Leviton
3. Equivalent by Hubbell

E. Isolated Ground:
1. 5-20R, Leviton 53k2-IGI with Orange triangle. See Device Color article below.
2. Provide at all computer/communications locations.
3. Four wire with self-ground mounting strap.
2. Weatherproof Outlets:
   1. Provide GFCI receptacle as specified above.
   2. Receptacle covers protected from rain shall be zinc die-cast weather-resistant cover with self-closing lid, Leviton 4992, P&S WIUCAST1, or equivalent.
   3. Receptacle covers not protected from rain shall be “While-In-Use” cover, Leviton 5977DGY, P&S WIUC10DGL, or equivalent.
   4. Do not use feed through feature for any GFCI receptacle.
   5. Install separate GFCI device at each location.

2.3 DEVICE PLATES
A. In kitchens, gyms, gang toilets and mechanical rooms, use stainless steel device plates and covers.
B. In other finished spaces use smooth nylon device plates and covers.
C. At exposed boxes in dry interior spaces use heavy cadmium-plated sheet steel. Plate edges must be flush with edges of boxes.
D. Device plate manufacturer and device manufacturer shall be the same so colors will match. Stainless steel plates will not match the device.

2.4 DEVICE COLOR
A. Device color to be ivory, except as otherwise indicated or required by code.

2.5 MANUFACTURERS
A. Products to be equivalent to the manufacturer, Pass & Seymour (P&S), and model numbers listed in this section. Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Corp. (Arrow Hart Division - formerly Cooper Industries)
   2. Bryant
   3. Hubbell Inc.
   4. Leviton MFG. Co., Inc.
   5. Pass & Seymour/Legrand

2.6 POKE-THRU DEVICES
A. Provide all telecommunications and data plates in each poke-thru as specified and noted on Communications Drawings. Lid color to match existing.
B. Wiremold Evolution 8AT

2.7 POWER/DATA RACEWAY DEVICES
A. Provide all telecommunications and data plates in power/data raceways as specified and noted on Communications Drawings. Devices to be compatible with power/data raceways as specified in Section 26 05 33.11.
3.1 INSTALLATION

A. Wall Switches:
   1. Install in a suitable outlet box on the strike side of the door.
   2. Mount at a height of 44" from the finished floor to the bottom of the switch.
   3. Position switches in a uniform position so that the same direction of operation will open
      and close the circuits throughout the job. Position up or to the left for the ON position.
   4. Do not install behind markerboards, millwork, permanent mounted equipment, etc. Verify
      on drawings before installation. Where installed in unsuitable location, the Contractor will
      move as directed at no cost to Owner.
   5. Prewired pigtail connectors that accommodate UL Fed Spec receptacles are approved
      for installation. P&S PlugTail or equal.

B. Receptacles:
   1. Install in a suitable steel outlet box.
   2. Mount vertically at a height of 18 inches from the finished floor to the bottom of the
      receptacle or as shown on the drawings.
   3. Provide tamper resistant receptacles in classrooms for third grade and below.
      Receptacles mounted higher than 5½ feet above the floor are exempt from this
      requirement.
   4. The Architect can move any receptacle, before installation, up to 6 feet in any direction
      at no additional cost.
   5. Do not install behind markerboards, millwork, permanent mounted equipment, etc. Verify
      on Architectural drawings before installation. Where installed in unsuitable location, the
      Contractor will move as directed at no cost to Owner.
   6. Prewired pigtail connectors that accommodate UL Fed Spec receptacles are approved
      for installation. P&S PlugTail or equal.

C. Device plates:
   1. Install device plates for each outlet box of the type required for service.
   2. Use a single one-piece device plate for ganged devices (switches & receptacle).
   3. Use separate device plates for dimmers, volume controls and electronic devices.

D. Poke-Thru Devices:
   1. Provide and install all wiring, devices, covers, plates, conduit and hardware as required
      for a complete installation. Do not daisy-chain poke-thru devices with conduits unless
      otherwise noted on drawings.
   2. Wiremold Evolution 8AT. Provide and install three duplex outlets and associated wiring
      per general notes on drawings. Provide isolated-ground outlets if indicated by symbol on
      drawings. Provide power to outlet using circuits shown on plans.

END OF SECTION
SECTION 26 28 13

FUSES

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements section 26 00 00 - Electrical and contains additional requirements applicable to fuses.

1.2 SECTION INCLUDES

A. Low voltage fuses rated below 600 volts and 2000 amperes.

1.3 RELATED SECTIONS

A. Section 26 00 00 - Electrical
B. Section 26 00 90 - Electrical Submittal Procedures

1.4 SUBMITTALS

A. Submit product data for fuses in accordance with Section 26 00 90 Electrical Submittal Procedures.

1.5 QUALITY ASSURANCE

A. Prior to ordering fuses or fuse holders, coordinate fuse ratings with the mechanical contractor to verify that fuses for HVAC equipment matches the MOCP values of the HVAC equipment being provided.

1.6 EXTRA MATERIALS

A. Spare fuses: For each size and type fuse installed, provide to the owner at substantial completion six each or 10% of the quantity used on the project, whichever is less.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. All fuses shall be from a single manufacturer. Products of the following manufacturers are acceptable.
   1. Bussman
   2. Littelfuse
   3. Mersen (formerly Ferraz Shawmut)

2.2 MANUFACTURED UNITS

A. 600-amp and less: Class RK-1 dual element, time delay.
B. 601-amp and larger: Class L or J

PART 3 EXECUTION
3.1 INSTALLATION

A. Check fasteners on fuse clips for tightness when installing fuses.

B. Install fuses so label is in an upright, readable position. Fuses without labels are not acceptable.

C. Do not install fuses until equipment is ready to be energized.

D. Fuse cabinet: For new buildings only, provide a fuse cabinet in the main electrical room. Cabinet to be lockable with depth equal to largest fuse provided. Minimum of 24” W x 24” H x 4” deep.

END OF SECTION
SECTION 26 28 16

ENCLOSED SAFETY SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SUMMARY

1.1.1 SECTION INCLUDES

A. Safety switches

B. Disconnect Switches

1.1.2 RELATED SECTIONS

A. Section 26 00 00 - Electrical

B. Section 26 00 90 - Electrical Submittal Procedures

C. Section 26 05 53 - Electrical Identification

D. Section 26 28 13 - Fuses

1.2 REFERENCES


B. NEMA KS 1 - Enclosed Switches.

1.3 SYSTEM DESCRIPTION

A. Safety switches shall be of the same manufacturer as distribution switchgear.

B. The extent of safety switches, disconnect switches is indicated on the drawings and by the requirements of this section.

C. In accordance with the service indicated, use 240 or 600 volt switches, single throw, fusible, or non-fusible, horsepower rated, 100% load break and make rated, designed for locking in "ON" or "OFF" position, in code gauge steel cabinets, as required by the application and the N.E.C.

D. Use switches which have number of poles required, dependent on equipment requirements.

E. Use NEMA 3R switches where exposed to weather, with weatherproof threaded hubs for top or side conduit entries into switch.

F. Use fuse clips which are rejecting type to accept Class RK or L fuses only.

G. Size fuses serving motor loads at 125% to 175% of motor nameplate rating, or the next standard size and as specifically recommended by motor or equipment manufacturer.

H. Provide a manual switch at each motor, class 2510 Square D, for motors shown with "MS." Provide a 20-AMP rated switch at each motor not otherwise noted.
1.4 SUBMITTALS

A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1 and Division 26, Section 26 00 90 requirements.

1.5 PRODUCT DATA

A. Submit product data for the following.
   1. Safety and Disconnect Switches

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. General Electric
B. Square D
C. Eaton Corporation (formerly Cutler-Hammer)

2.2 SWITCHES

A. Provide safety switches and disconnects with a voltage rating suitable for the nominal voltage of the system in which they are to be applied. Contacts are quick-make, quick-break.

2.3 CONSTRUCTION

A. Indoor dry locations, 30 amp thru 100 amp, use NEMA 1 general duty (GD).
B. All outdoor locations use NEMA 3R heavy duty (HD).
C. The handle shall be suitable for padlocking in the OFF position. Defeatable, front accessible, coin-proof door interlock to prevent opening the door when the switch is in the ON position and to prevent turning the switch ON when the door is open. Incoming line terminals with an insulated shield.
D. Provide switches with rejection-type fuse holders suitable for use with fuses specified under Section 26 28 13.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mount switches no more than 6 inches above and within 6 feet of the equipment served at the direction of the Engineer, so that operating handle is easily accessible. Align tops of switches when grouped together.
B. Mount vertically on required separate support system hardware with switch easily accessible (door to open 90 degrees minimum).
C. Permanently mount safety switches from inside with plated or stainless bolts, toggle bolts or anchors.
D. Exposed mounting bolts, screws, etc. are not acceptable.
E. Permanently install fusible switches with class R fuse kits so that fuses are readable when looking at open switch.

F. Do not mount switches/disconnects to access panels or on nameplate data or equipment.

G. Installation of Conductors: Switches shall not be used as “junction boxes” between HVAC units (splicing or “pig tailing” is not permitted). The maximum number of conductors allowed per termination is determined by the manufacturer’s approved rating for each terminal or lug. Multiple conductor configurations shall be highlighted in the contractor’s submittal package. Exceptions to this rating must be obtained in writing from the engineer’s office on a case by case basis.

H. Coordinate and verify exact fuse sizes with mechanical contractor. Fuses shown on drawings are based on one manufacturer. Fuse sizes vary depending on manufacturer.

I. Identification: Refer to Section 26 05 53 for Electrical Identification. Provide name plate identification on all HVAC equipment regardless of equipment location.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This section supplements section 26 00 00 - Electrical and contains additional requirements applicable to all lighting systems.

1.2 SECTION INCLUDES

A. Interior and exterior lighting systems, with the exception of sports lighting and theatrical lighting.

B. Luminaires, lamps, ballasts, LED drivers, emergency battery packs, emergency power transfer devices.

1.3 RELATED SECTIONS

A. Section 26 00 00 - Electrical

B. Section 26 00 90 - Electrical Submittal Procedures

C. Section 26 09 41 - Lighting Controls

1.4 REFERENCES

A. Energy Star

B. DLC - DesignLightsTM Consortium

C. TCLP - Federal Toxicity Characteristic Leaching Procedure

D. UL 1598 - Safety Standard for Luminaires

E. ANSI/UL 844 - Safety Standard for Electric Lighting Fixture for Use in Hazardous Locations

F. ANSI C78.377 - Specification for the Chromaticity of Solid State Lighting Products

G. ANSI/UL 1029 - Safety Standard for High Intensity Discharge Lamp Ballasts

H. NECA/IESNA 500 (2006) - Recommended Practice for Installing Indoor Commercial Lighting Systems


J. UL 8750 - Safety Standard for LED Equipment for Use in Lighting Products

K. UL 924 - Standard for Emergency Lighting and Power Equipment

L. UL 935 - Safety Standard for Fluorescent-Lamp Ballasts

N. LM-80 - Approved Method: Measuring Lumen Maintenance of LED Light Sources

O. TM-21 - Projecting Long Term Lumen Maintenance of LED Light Sources

1.5 PERFORMANCE REQUIREMENTS

A. All lighting systems shall be compatible with lighting controls shown on the drawings or specified in 26 09 41 – Lighting Controls.

1.6 SUBMITTALS

A. Submit in accordance with Section 26 00 90 - Electrical Submittal Procedures.

1.7 PRODUCT DATA

A. Submit complete product information for the following:
   1. Luminaires
   2. Lamps
   3. Ballasts
   4. LED drivers
   5. Battery backup units
   6. Automatic transfer devices for emergency lighting
   7. Product warranty documentation

B. Submit luminaires shown on the Luminaire Schedule on the drawings and those noted on the drawings but not on the schedule.

C. Include complete manufacturer’s part numbers.

D. Clearly highlight or otherwise indicate on the cut sheets all options and accessories.

E. Indicate if DLC listing applies only to certain color temperatures, beam spreads, or other luminaire options. Indicate if any luminaire options void the DLC listing.

F. Indicate the L70 rating and the number of LM-80 testing hours for all LED luminaires.

1.8 SAMPLES

A. Submit non-returnable samples of fixtures upon request. Include all lamps and ballasts.

1.9 QUALITY ASSURANCE/CONTROL SUBMITTALS

A. This project may require compliance with the Windstorm Inspection Program of the Texas Department of Insurance (TDI). Refer to Division 01 specifications to determine whether windstorm certification is required, and for submittal requirements of the TDI Windstorm Inspection Program.

1.10 CLOSEOUT SUBMITTALS

A. Provide owner a list of all luminaire types used on the project using manufacturer part numbers.
B. Provide owner a list of all ballast types and lamp types used on the project using ANSI and manufacturer codes.

C. Provide owner a list of battery backup, automatic transfer devices, etc. on the project using manufacturer part numbers. Provide on as-built drawings the location of all remote-mounted battery backups.

1.11 QUALIFICATIONS

A. All luminaires shall be from manufacturers who has been regularly engaged in the production of such products for the past five years.

1.12 REGULATORY REQUIREMENTS

A. All luminaires and components, including lamps, ballasts, emergency battery packs, transfer devices, LED modules and drivers shall be UL listed.

B. This project may require compliance with the Windstorm Inspection Program of the Texas Department of Insurance (TDI). Refer to Division 01 specifications to determine whether windstorm certification is required, and for requirements of the TDI Windstorm Inspection Program.

1.13 STORAGE AND PROTECTION

A. Store all product in accordance with manufacturer’s storage requirements.

1.14 SPECIAL WARRANTY

A. Provide a 1 year manufacturer’s warranty for all fluorescent and HID luminaires.

B. Provide a 5 year manufacturer’s warranty for all LED luminaires. The warranty shall include all luminaire components including, but not limited to, LED arrays, LED drivers, luminaire body and hardware. LED arrays will be considered defective if a total of 15% or more of the individual light emitting diodes fail to illuminate.

C. Provide a 1 year manufacturer’s warranty for all lamps.

D. Provide a nominal 5 year (25,000 burn hours over 60 months) manufacturer’s warranty for all ballasts.

E. Provide a 5 year manufacturer’s full warranty for all battery packs.

F. The warranties shall cover the cost of materials and labor for repair and installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Only those manufacturers of luminaires, lamps, and ballasts listed on the Luminaire Schedule or listed in the specifications are acceptable.

B. Provide lamps from one manufacturer, unless otherwise required.

C. Provide ballasts from one manufacturer, unless otherwise required.
D. Accepted ballast manufacturers:
   1. Osram Sylvania
   2. General Electric
   3. Philips Advance
   4. Universal

E. Accepted lamp manufacturers:
   1. Osram Sylvania
   2. General Electric
   3. Philips

2.2 EXISTING PRODUCTS

A. New luminaires must match existing luminaires in all areas including but not limited to style, color, orientation, mounting height, ballast and lamp type, switching capability, voltage, etc. The new luminaires must meet or exceed the quality of the existing luminaires and must meet all current codes and standards for efficiency.

B. New lamps and ballasts must match existing lamps and ballasts regarding manufacturer and operation. The new lamps and ballasts must meet or exceed the quality of the existing lamps and ballasts, and must meet all current codes and standards for efficiency.

2.3 LUMINAIRES

A. The following requirements apply to all luminaires. See following articles for additional requirements for specific types of luminaires.

B. Only those products listed on the Luminaire Schedule or noted in the drawings are acceptable.

C. Unless otherwise noted, consult architect for luminaire color or finish.

D. All fluorescent and HID luminaires shall comply with UL 1598 requirements and be UL listed.

E. All luminaires used in hazardous locations shall comply with UL 844 requirements and be UL listed.

F. All luminaires used for emergency lighting, including exit lights, shall be UL 924 listed.

2.4 LED LUMINAIRES

A. LED luminaires shall meet the following requirements in addition to the general requirements for luminaires listed above.

B. All LED luminaires shall comply with UL 8750 requirements and be UL listed.

C. All LED general purpose luminaires shall be either Energy Star or DLC approved.

D. Expected Life: All LED luminaires shall have a minimum L70 of 50,000 hours. The estimated L70 of LED luminaires shall be derived from LM-80 test data in accordance with TM-21 procedures. LM-80 test data shall be measured in accordance with LM-79 procedures.

E. Color rendering: All interior LED luminaires shall have a minimum CRI of 82. All exterior LED luminaires shall have a minimum CRI of 70.
F. Color temperature: Unless specified to the contrary, all LED luminaires on the same project are to have the same correlated color temperature (CCT). See the Luminaire Schedule for LED CCT. LED luminaire CCT shall be within a 3-step SCDM (Standard Deviation Color Matching) in accordance with ANSI C78.377.

G. Maximum power: The maximum power input of all LED luminaires shall be as indicated on the Luminaire Schedule, with a tolerance of +5% / -10%.

H. Efficacy: All general purpose LED luminaires shall have a minimum efficacy of 90 lumens/watt.

I. Lumen output: The lumen output of all LED luminaires shall be as indicated on the Luminaire Schedule, with a tolerance of plus or minus 8%.

2.5 EXIT SIGNS

A. LED exit signs shall also meet the following requirements in addition to the general requirements for LED luminaires.

B. LED exit signs shall be rated for at least 10 years unless otherwise noted.

C. LED exit signs shall be provided with maintenance free batteries good for at least 90 minutes.

D. LED exit signs shall be provided with status indicator lamp and test switch.

E. Powered LED exit signs shall be UL tested and approved with 100’ visibility.

F. Non-LED self-luminous exit signs shall be good for at least 20 years and shall be UL tested and approved with 100’ visibility.

G. Exit signs in gyms shall have a wire guard.

2.6 LAMPS

A. The following requirements apply to all lamps. See following articles for additional requirements for specific types of lamps.

B. Ballast compatibility: Lamps shall match the ballast starting type.

C. All lamps shall pass the TCLP criteria for classification as non-hazardous waste.

2.7 ACCESSORIES

A. Lenses: Lenses for fluorescent and LED troffers shall be 100% virgin acrylic and have a nominal thickness of 0.125 inch.

B. Emergency Battery Packs: Emergency battery packs shall be factory installed. All emergency luminaire troffers shall operate at 1400 lumen or greater output for at least 90 minutes. All battery backups installed in exterior luminaires shall be rated for damp location and rated to operate at 32°F.
3.1 SITE VERIFICATION OF CONDITIONS

A. Field verify existing conditions to determine luminaire quantities, spacing, location, orientation, mounting height, input voltage, color, switching arrangement, etc. to install in each space to properly serve the switching arrangement, lamp type, lamp quantity, voltage, feeder condition, etc. of existing luminaires to be replaced or added to. All replacement luminaires shall match these physical characteristics or the standard outlined in this specification, whichever is greater.

3.2 INSTALLATION

A. Provide all luminaires of the types indicated, in accordance with NEMA standards, manufacturer’s recommendations, and NEC requirements.

B. Install indoor lighting systems in accordance with NECA/IESNA-500.

C. Install exterior lighting systems in accordance with NECA/IESNA-501.

D. Provide luminaires complete with lamps, ballasts, LED arrays, LED drivers, and other accessories necessary for proper installation in the building construction and listed for fire rated ceilings where required by code.

E. Lighting control: Provide switches with matching technology (Mark VII, Mark X, etc.) for dimming ballasts in the locations shown on the drawings. Provide lighting controls in accordance with sections 26 09 41 – Lighting Controls.

F. Emergency lighting: Provide a battery backup, transfer switch, internal wiring etc. in each luminaire indicated as an emergency luminaire or night light. If a type designation is omitted from an emergency luminaire then furnish a battery backup or automatic transfer device in the standard luminaire and make it an emergency luminaire. If the unswitched hot leg needed for proper operation does not exist, provide a new unswitched hot leg to the luminaire as needed for proper operation. The unswitched hot wire must come from the same branch circuit that powers the luminaire.

G. Verify that the specified luminaires are compatible with the specified ceiling systems as indicated on the Architectural drawings. Advise the Architect/Engineer of any discrepancies before placing the luminaire order.

H. Locate luminaires in mechanical and other similar equipment rooms to clear all obstructions. Obtain approval from the architect or engineer before placing luminaires where the location as shown on the drawings must be radically changed.

I. Support surface mounted luminaires from the building structure with a minimum of two 1/4 inch threaded rods per fixture. Use 1½ inch x 1½ inch steel framing channel where required to span joists and otherwise facilitate structural support.

J. Mount recessed luminaires in the center of a ceiling tile or as shown on the drawings. Provide support for recessed luminaires by means of bar hangers extended across the main ceiling support members and also supported from the building structure.

K. Run fixture whips (flex conduit/metal clad cable) from a junction box to each fixture (not to exceed four fixtures per junction box) access plate. Fixture whips between light fixtures will not be accepted. Whips shall not be more than 6'-0" in total length.

L. Provide remote mounted ballasts for any HID luminaire used in a library or other space where sound is a concern.
M. Locate all remote ballasts above the ceiling above each luminaire or in an adjacent room with a low ceiling for easy access. Mount ballasts on rubber insulators.

N. Exit signs: Exit signs are not to be switched.

O. HID Burn-in: Burn in all HID lamps 100 hours before occupancy by owner or tenant. All HID lamps intended to be dimmed must be burned in for at least 100 hours at full voltage before being dimmed.

P. Prior to final inspection, check all luminaires for damages during construction and replace damaged luminaires at no additional expense to the Owner. Test all emergency luminaires for proper operation, including exercising all transfer switching, battery backups, generator, etc. All luminaires shall be cleaned and completely lamped at the time of final acceptance of the building.

3.3 REPAIR/RESTORATION

A. Some or all luminaires on this project are to be repaired. Verify existing conditions and repair or restore existing conditions to like new condition by replacing all lamps, replacing all ballasts, cleaning luminaires, etc. See drawings for extent of work.

3.4 RE-INSTALLATION

A. This renovation project will require some HVAC ducts to be accessed or replaced. Tie all existing luminaires to the structure in areas where ceiling is to be removed but the luminaires are to be kept. Once the HVAC work is complete and the new or existing ceiling is re-installed, drop the existing luminaires back into the existing locations in the ceiling.

3.5 ADJUSTING

A. Move any luminaire up to six feet in any direction as directed at no additional cost.

3.6 CLEANING

A. Clean luminaire lenses inside and out in accordance with manufacturer’s specifications.

END OF SECTION