RENOVATION AND ADDITION TO
FT. SAM HOUSTON ELEMENTARY SCHOOL
&
RENOVATION AT
COLE HIGH SCHOOL

Ft. Sam Houston Independent School District
Ft. Sam Houston
San Antonio, TX

PROJECT MANUAL
VOLUME 1

SHW Project No. 4512.013.00/4512.014.00

ISSUED FOR BIDDING & CONSTRUCTION

JUNE 25, 2014

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FA104 FIRST LEVEL FIRE ALARM PLAN
FA501 FIRE ALARM DETAILS
FD111 FIRE PROTECTION DEMOLITION PLAN - AREA B
FP111 FIRST LEVEL FIRE PROTECTION PLAN - AREA A
FP112 FIRST LEVEL FIRE PROTECTION PLAN - AREA B
FP501 FIRE PROTECTION DETAILS AND SCHEDULES
SECTION 00 01 10.05 and 00 01 10.06 — TABLE OF CONTENTS OF THE MECHANICAL AND PLUMBING SPECIFICATIONS

Note: Project Manual Specification Divisions not containing specification sections prepared by the Mechanical Consultant have been omitted for clarity. Refer to Section 00 01 10 — TABLE OF CONTENTS OF THE PROJECT MANUAL for a complete list of specification sections.

DIVISION 20 — COMMON

<table>
<thead>
<tr>
<th>Specification Division</th>
<th>Description</th>
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<tbody>
<tr>
<td>20 05 00</td>
<td>COMMON WORK RESULTS</td>
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<tr>
<td>20 05 13</td>
<td>COMMON MOTOR REQUIREMENT FOR EQUIPMENT</td>
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<td>20 05 14</td>
<td>VARIABLE FREQUENCY DRIVES</td>
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<td>20 05 16</td>
<td>EXPANSION FITTINGS AND LOOPS FOR PIPING</td>
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<td>20 05 19</td>
<td>METERS AND GAGES</td>
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<td>20 05 23</td>
<td>GENERAL-DUTY VALVES FOR PIPING</td>
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<td>HANGERS AND SUPPORTS</td>
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<td>20 05 33</td>
<td>HEAT TRACING</td>
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<td>20 05 48</td>
<td>VIBRATION CONTROLS</td>
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<td>20 05 53</td>
<td>MECHANICAL IDENTIFICATION</td>
</tr>
<tr>
<td>20 05 93</td>
<td>TESTING, ADJUSTING AND BALANCING FOR HVAC</td>
</tr>
<tr>
<td>20 07 00</td>
<td>MECHANICAL INSULATION</td>
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<tr>
<td>20 08 00</td>
<td>COMMISSIONING</td>
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DIVISION 21 — FIRE PROTECTION

<table>
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<tr>
<th>Specification Division</th>
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<tr>
<td>21 11 10</td>
<td>FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING</td>
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<td>21 13 13</td>
<td>WET-PIPE SPRINKLER SYSTEMS</td>
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DIVISION 22 — PLUMBING

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<td>22 11 16</td>
<td>DOMESTIC WATER PIPING</td>
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<td>22 11 19</td>
<td>DOMESTIC WATER PIPING SPECIALTIES</td>
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<tr>
<td>22 11 23</td>
<td>DOMESTIC WATER PUMPS</td>
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<tr>
<td>22 13 16</td>
<td>SANITARY WASTE AND VENT PIPING</td>
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<tr>
<td>22 13 19</td>
<td>SANITARY WASTE PIPING SPECIALTIES</td>
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<tr>
<td>22 34 00</td>
<td>FUEL FIRED DOMESTIC WATER HEATERS</td>
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<tr>
<td>22 42 00</td>
<td>COMMERCIAL PLUMBING FIXTURES</td>
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<td>22 45 00</td>
<td>EMERGENCY PLUMBING FIXTURES</td>
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<td>22 47 00</td>
<td>DRINKING FOUNTAINS &amp; ELECTRIC WATER COOLERS</td>
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DIVISION 23 — HVAC

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<td>HYDRONIC PIPING SPECIALTIES</td>
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<td>REFRIGERANT PIPING</td>
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<td>23 25 00</td>
<td>HVAC WATER TREATMENT</td>
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<td>23 31 13</td>
<td>METAL DUCTS</td>
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<td>23 33 00</td>
<td>AIR DUCT ACCESSORIES</td>
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<td>23 34 23</td>
<td>HVAC POWER VENTILATORS</td>
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<tr>
<td>23 36 00</td>
<td>AIR TERMINAL UNITS</td>
</tr>
<tr>
<td>23 37 13</td>
<td>DIFFUSERS, REGISTERS AND GRILLES</td>
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<tr>
<td>23 37 23</td>
<td>HVAC GRAVITY VENTILATORS</td>
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23 41 00    PARTICULATE AIR FILTRATION
23 51 00    BREECHINGS, CHIMNEYS, AND STACKS
23 52 16    CONDENSING BOILERS
23 55 33    FUELE- FIRED UNIT HEATERS
23 64 23    SCROLL WATER CHILLERS
23 73 13    MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS
23 81 26    SPLIT-SYSTEM AIR-CONDITIONERS
23 82 41    WALL AND CEILING ELECTRIC UNIT HEATERS

END OF SECTION 00 01 10.05 and 00 01 10.06
REQUEST FOR COMPETITIVE SEALED PROPOSALS
FOR SELECTION OF A GENERAL CONTRACTOR
FOR RENOVATION AND ADDITION TO
FT. SAM HOUSTON ELEMENTARY SCHOOL
&
RENOVATION AT
COLE HIGH SCHOOL

FOR THE
FT. SAM HOUSTON INDEPENDENT SCHOOL DISTRICT

ARCHITECT

SHW Group now STANTEC

Stantec Architecture Inc.
1344 South Flores Street Suite 201
San Antonio TX  78204-1672
Tel: (210) 223-9588
Fax: (210) 223-9589

JUNE 25, 2014
INSTRUCTIONS TO OFFERORS

Article I. Nature of Project:

1. General Information. The Ft. Sam Houston Independent School District (hereafter called the "Owner" or "District" or "FSHISD") will receive Competitive Sealed Proposals for construction services in connection with the following project:

FOR RENOVATION AND ADDITION TO FT. SAM HOUSTON ELEMENTARY SCHOOL & RENOVATION AT COLE HIGH SCHOOL

(hereafter collectively called the "Project") in accordance with the Drawings, Specifications, and other Contract Documents dated June 25, 2014 ("Drawings and Specifications") and prepared by SHW Group now STANTEC (hereafter called "Architect"). This Request for Competitive Sealed Proposals ("RCSP") is the only step for selecting a General Contractor for the various Projects as provided by Texas Government Code Chapter 2267, Subchapter D. The RCSP provides the information necessary to prepare and submit Competitive Sealed Proposals for consideration and ranking by the Owner.

Offerors shall submit a proposal for the Project (Attachment A-1) as a single proposal indicating a proposal for the Base Bid with listed Alternates.

Owner intends to award a contract for construction to one Contractor.

Each Offeror’s proposals will be be assessed against others proposing on the Projects. The evaluation in each case will be based upon the criteria and weight of criteria listed herein. The Owner may select the Proposal that offers the “best value” for the District based on the published selection criteria and relative weight of criteria, and on its ranking evaluation.

Based on its ranking, the Owner may first attempt to negotiate a contract with the selected Offeror. The Owner may discuss with the selected Offeror options for a scope or time modification and any price change associated with the modification. If the District is unable to reach a contract with the selected Offeror, the District may formally end negotiations with that Offeror and proceed to the next “best value” Offeror for the Project in the order of the selection ranking until a contract is reached or all proposals are rejected.

2. General Project Descriptions.

- **BASE BID 1: RENOVATION AND ADDITION TO FT. SAM HOUSTON ELEMENTARY SCHOOL – APPROXIMATELY 6,790 SQUARE FEET OF RENOVATION AREA AND 19,559 SQUARE FEET OF BUILDING ADDITION.** Work includes renovation of existing administrative areas, cafeteria (not Kitchen area); Addition to the elementary school to include classrooms, support offices and expansion of the stage area at the cafeteria; Additional work will include fire sprinkler, mass notification, HVAC, security, new windows, asbestos abatement. New window installation will require adherence to Federal government design standards of Anti-Terrorism Force Protection guidelines.

- **BASE BID 2: RENOVATION OF FORMER CAFETERIA SPACE INTO CLASSROOMS – APPROXIMATELY 8,418 SQUARE FEET.** Former cafeteria space at Cole High School will be
renovated to add two classrooms, Art Room, Life Skills Area and renovation of existing Medical Clinic.

- **ALTERNATES**
  - **Alternate 1 – Window Replacement at Ft. Sam Houston Elementary School:**
    Replacement of existing windows with new windows and structural upgrades/reinforcements to accommodate the new windows. New windows and structural upgrades/reinforcement will require adherence to the federal government design standards of Anti-Terrorism Force Protection guidelines. Refer to drawings for extent of work.
    - Alternate #1 also includes the asbestos abatement associated with the replacement of the windows noted above

The current estimated construction budget for the Base Bid and the Alternates is

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Bid 1</td>
<td>$6,500,000.00</td>
</tr>
<tr>
<td>Base Bid 2</td>
<td>$1,750,000.00</td>
</tr>
<tr>
<td>Alternate 1</td>
<td>$975,000.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$9,225,000.00</strong></td>
</tr>
</tbody>
</table>

The Projects are all more fully described in the Contract Documents and Specifications available from the Architects.

3. **Points-of-Contact.** The Owner designates the following person as its Architect’s representative regarding the Construction Drawings and Specifications:

   SHW Group now STANTEC  
   Attention: Edward J. Rodriguez, AIA  
   1344 South Flores, Suite 201  
   San Antonio, Texas 78204  
   Telephone: 210-222-9588  
   E-mail: erodriguez@shwgroup.com

Offerors shall restrict all contact with the Owner and direct all questions regarding this RCSP, including questions regarding terms and conditions, to the Architects specified above. **Do not contact members of the Board of Trustees or other employees of the Ft. Sam Houston Independent School District.** Contact with any of these prohibited individuals after issuance of the RCSP and before selection is made, may result in disqualification of your proposal.

4. **Project Planning Schedule.** Time is of the essence. The Projects must be Substantially Complete on or before June 30, 2015, except as such date may be extended by delays approved by Owner in accordance with the terms of the Contract Documents governing the construction of the Projects. The following anticipated dates are for planning purposes only. The contractual dates required by the Owner of the “best value” Offeror will be identified in the executed Agreement.

<table>
<thead>
<tr>
<th>Event</th>
<th>Date/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Documents Available</td>
<td>June 26, 2014 at 3:00pm</td>
</tr>
<tr>
<td>Pre-proposal Conference</td>
<td>July 8, 2014 at 10:00am</td>
</tr>
<tr>
<td>Deadline for Submission of Proposals</td>
<td>July 24, 2014 at 2:30pm</td>
</tr>
<tr>
<td>Substantial Completion of All Projects</td>
<td>June 30, 2015</td>
</tr>
</tbody>
</table>

5. **Access To Project Site On Ft. Sam Houston.** The projects are located on Ft. Sam Houston, located in San Antonio, TX. This is a federal military installation. Strict adherence to rules and guidelines when accessing and working on the military installation is required. Each Offeror is
encouraged to be familiar with access requirements and with working requirements on a federal military installation

6. **Attendance at the Pre-Proposal Conference.**

   Access to Pre-Proposal Conference is through the Winans Road Gate.

   - From Harry Wurzbach Road, turn east onto Winans Road. At the stop sign, go straight toward guard post. Vehicle driver and all passengers must have valid photo identification; vehicle registration and inspection decals must be current. Proceed east on Winans Road.

   - Turn left into parking lot adjacent to the Ft. Sam Houston ISD (FSHISD) Administrative Offices. The meeting will be held in the Professional Development Center immediately behind the Administrative Office.

   - FSHISD vehicles will be used to transport proposers to the Elementary School site. Provide the names of the company representatives via email to Julie Novak at jnovak@fshisd.net no later than 2:00pm on Monday, July 7, 2014.

   - Access to the Cole High School project site will not require proposers to be transported

**Article II. Form of Proposals:**

1. Proposals must be submitted in a 3-ring binder enclosed in a sealed opaque envelope plainly marked:

   RFP for CONSTRUCTION
   FOR RENOVATION AND ADDITION TO
   FT. SAM HOUSTON ELEMENTARY SCHOOL
   &
   RENOVATION AT
   COLE HIGH SCHOOL

   and shall bear the name and address of the Offeror. All proposals must be received at the Offices of SHW Group now STANTEC, located at 1344 South Flores Suite 201, San Antonio, Texas 78204, no later than on or before **2:30 PM on Thursday July 24, 2014.** Immediately following this deadline, the District will publically open the proposals and read aloud the names of the Offerors and the prices stated in their respective proposals. Proposals submitted prior to the above time and date may be modified provided such modifications are sealed and received at the designated location, prior to the time and date set for submission of proposals. **Proposals received after the deadline will not be accepted and will be returned unopened to the Offeror.**

2. To achieve a uniform review process and obtain the maximum degree of comparability, it is required that proposals be organized in the manner specified. Three (3) sets of the proposal responses are required. The presentation must have one (1) original set. This original set should be labeled ORIGINAL and contain original signatures, preferably in blue ink. The remaining sets are to be labeled COPY.

3. The proposal shall be submitted in the order and manner set forth below:

   A. **MONETARY PRICE PROPOSAL.** Provide a Stipulated Sum Price Proposal for all labor, services, materials, tools, equipment, and supervision necessary for final completion of construction of the Project in accordance with the Project Schedule, Contract Documents (including General Conditions of the Contract), Drawings and Specifications, Addenda and other Construction Documents provided. Offeror’s Proposal shall include no amount for sales or use taxes for which District is exempt. Such taxes shall not be reimbursable costs. Offeror
shall use the Monetary Proposal Forms attached hereto as **RCSP Attachment A-1** of its Monetary Proposals.

**B. OFFEROR QUESTIONNAIRE:** Complete, sign and submit the Offeror Questionnaire, **RCSP Attachment B.**

**C. FELONY CONVICTION NOTIFICATION:** Complete, sign and submit the Felony Conviction Notification Form, **RCSP Attachment C.**

**D. NON-COLLUSION AFFIDAVIT:** Complete and submit the Non-Collusive Affidavit of Prime Offeror, **RCSP Attachment D.**

**E. BID SECURITY.** Submit Bid Security Documents as required by Article III of this Request for Competitive Sealed Proposals.

**F. CONFLICT OF INTEREST QUESTIONNAIRE.** Chapter 176 of the Texas Local Government Code requires that persons, or their agents, who seek to contract for the sale or purchase of property, goods, or services with FSHISD shall file a completed Conflict of Interest Questionnaire (CIQ) with the District. The CIQ should be submitted as part of the Proposer’s response to this RCSP. The CIQ is available from the Texas Ethics Commission at [www.ethics.state.tx.us](http://www.ethics.state.tx.us). Please consult your own legal advisor if you have questions regarding the statute or form.

**G. SIGNATURE PAGE:** Complete, sign and submit Signature Page, **RCSP Attachment E.** The Signature Page must be signed by a person, or persons, authorized to bind the entity, or entities, submitting the proposal. Proposals signed by a person other than an officer of the company or partner of the firm shall be accompanied by evidence of authority.

4. Offerors are expected to examine this RCSP carefully, understand the terms and conditions for providing the services listed herein and respond completely. **FAILURE TO COMPLETE AND PROVIDE ANY OF THE ABOVE ITEMS MAY RESULT IN THE OFFEROR’S PROPOSAL BEING DEEMED NON-RESPONSIVE AND THEREFORE DISQUALIFIED FROM CONSIDERATION.**

5. No Proposal, or modification to a Proposal, shall be made orally or by telephone, e-mail, or by facsimile transmission (“fax”).

6. A proposal may be withdrawn by written or telegraphic request received by Owner prior to the time fixed for opening. Two (2) signed copies of any such telegraphic withdrawal should be forwarded immediately to Owner in a sealed opaque envelope properly marked to identify the contents. Faxed proposals, bid bonds, etc., are not acceptable.

7. All proposals shall be computed exclusive of the Texas Sales Tax; that is, such tax shall not be added to the amount offered for the construction of the Project.

8. Owner reserves the right to request supplemental information of any and all Offerors to aid the Owner in the evaluation process.

**Article III. Bid Security.**

1. Offeror must submit a certified or cashier’s check or proposal bond, in the amount of in the amount of Five Percent (5%) of the Offeror’s Monetary Price Proposal, made payable to the Ft. Sam Houston Independent School District.

2. If a proposal bond is provided it must be executed by a corporate surety acceptable to the District, which is licensed pursuant to the Texas Insurance Code and listed on the United States Department of the Treasury’s Listing of Approved Sureties (Dept Circular 570). The Proposal Bond must be valid for forty-five (45) days following the deadline for submission of proposals; must be
conditioned upon the Contractor entering into the Contract in writing with the Owner in accordance with terms of the proposal, and furnishing such bonds and other instruments as may be specified in the Contract Documents with good and sufficient Surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; must be accompanied by an original signed and notarized Power-of-Attorney bearing the seal of the issuing surety company; and reflect that the signatory to the bond is a designated Attorney-in-Fact.

3. Time is of the essence, and the award of the contract to the successful Offeror is expressly conditioned upon (i) the Offeror’s execution and delivery of the contract, and delivery of all required payment and performance bonds and evidence of insurance, within ten (10) calendar days after the successful Offeror is notified of the acceptance of its proposal, and (ii) the Offeror’s timely fulfillment of any and all other preconditions expressly set forth in the Contract Documents. Should the Offeror fail to timely execute and deliver the contract, required bonds, evidence of insurance, or fail to timely fulfill any other such preconditions, the Owner may, at its option and discretion, without releasing, impairing or affecting its right to receive the security as damages for such failure, rescind the award and thereafter negotiate with and award the contract to the next ranked Offeror, or may reject all Proposals.

4. All bid security will be returned or released at such time as the Construction Contract has been executed by the successful Offeror. However, if Owner fails to accept any proposal within thirty (30) days after the date scheduled for opening of proposal and an Offeror withdraws his proposal, his security shall also be returned.

Article IV. Selection Criteria and Weight of Criteria

1. The District will select a construction contractor from the Offerors to this request for proposals, or reject all proposals. Pursuant to Texas Government Code Chapter 2267, Subchapter D, and §2267.055, the District will rank the proposals based on the following criteria and relative weights:

<table>
<thead>
<tr>
<th>WEIGHT</th>
<th>CRITERIA</th>
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<tbody>
<tr>
<td>40%</td>
<td>Price</td>
</tr>
<tr>
<td>25%</td>
<td>Experience with Similar Projects and Reputation of Offeror and Quality of Services</td>
</tr>
<tr>
<td>10%</td>
<td>Offeror’s Follow-up on Project Closeout, Warranty and Corrective Work</td>
</tr>
<tr>
<td>5%</td>
<td>Offeror’s demonstrated ability to deliver projects on time and within budget</td>
</tr>
<tr>
<td>20%</td>
<td>Offeror’s Project Personnel, Resources and Financial Stability</td>
</tr>
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</table>

2. All responses in the proposal may be used to help the District select a contractor based on these criteria. The District reserves the right to verify the accuracy and completeness of all responses by utilizing any information available to the District without regard to whether such information appears in the proposal.

3. In submitting its proposal, the Offeror agrees and understands that the Owner shall not be obligated to award a construction contract for this Project strictly on the basis of the lowest monetary offer proposed.

4. By submission of his Proposal, the Offeror also agrees to waive all rights to claims against the District, or persons authorized by the District, including the Architects, for any damages whatsoever arising from the Owner’s or said person’s evaluation of the Offeror’s proposal and/or qualifications to perform this specific project.

5. If required by the Owner after the receipt of competitive sealed proposals, additional project cost modifications may be requested for further negotiations.
6. **Note: Texas Public Information Act:** During the course of the selection process, the proposals are exempt from disclosure to the public under the Texas Public Information Act, because they contain information that, if released, would give advantage to a competitor or bidder. The proposals will however, upon the award of the contract, become a public record; and therefore, subject to disclosure to any person who makes a proper request for review of the documents. Some of the information you may provide in your proposals will contain commercial or financial information which are privileged or confidential by statute, or which you feel may cause substantial competitive harm to your business if disclosed by the District to a third-party even after the award. You may be entitled to protect this information at the time the request is made for disclosure; however, you will need to consult your legal counsel to assure that this kind of information, if included, is properly marked as confidential prior to submission. Wholesale marking of your entire proposal “Confidential” or “Proprietary” will not be effective.

**Article V. Examination of Contract Documents and Site:**

1. Construction Drawings and Specifications which are incorporated by reference in this RCSP will be maintained on file at the offices of the Architects, where they may be inspected during regular business hours without charge.

2. A complete set of Contract Documents may be temporarily borrowed from the Architects offices upon deposit of **One Hundred Dollars ($100.00)** for EACH SET. No partial sets of Contract Documents will be provided. The deposit will be refunded in full upon return of the complete set of documents in good condition within ten (10) days after the submission deadline. Checks for such deposit should be made payable to: Ft. Sam Houston Independent School District. Shipping costs, if any, shall be borne by the prospective Offeror. The One Hundred Dollar ($100) deposit is not required if the Offeror currently has a deposit on file with SHW Group for the previous Ft. Sam Houston District Wide Improvements Project.

3. If any Offeror is in doubt as to the meaning of any part of the Drawings, Specifications, or other Contract Documents, or if Offeror discovers what he or she considers to be a discrepancy, omission or conflict in such Contract Documents, Offeror shall immediately call the Architects attention to same by written notice or request for an interpretation of same. If such written notice or request is delivered to the Architects prior to 72 hours before the deadline for receipt of Proposals, the Architects shall issue a written addendum, forwarded to all persons who, to the knowledge of the Architects, are prospective Offerors setting out any corrections to such Contract Documents or the Architects interpretation thereof, as the case may be. Any opinion expressed by Architects in interpreting the Contract Documents shall not be binding upon Owner, nor does Architects warrant that the Owner will accept his interpretation of such documents.

4. Each Offeror, before submitting his Proposal, shall fully examine and acquaint himself with the Contract Documents and the site of the proposed Project. Offeror shall make such investigations as he or she may deem necessary to fully inform himself of the existing conditions, facilities, difficulties, restrictions and requirements incident to completion of the Project under the terms of the Contract.

5. Failure of the Offeror to acquaint himself or herself adequately with the site and such conditions, facilities, difficulties, restrictions and requirements will not relieve Offeror of its obligation to perform the entire Contract at the price set forth in this proposal.

**Article VI. Contract Documents, Drawings and Specifications.**

1. The form of Construction Contract utilized for this Project shall be the Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, AIA Document A101-2007, as amended by Owner attached hereto as Appendix A-1; the General Conditions of the Contract for Construction, AIA Document A201-2007, as modified by the Owner,
attached hereto as Appendix A-2 and the Plans and Specifications prepared by the Design Architects referenced therein.

Article VII. Addenda.

1. Changes in or official interpretations of the Contract Documents will be made only by written addenda. Receipt of all addenda issued by Architects shall be acknowledged in each Offeror’s proposal, and shall constitute a part of the final contract. It is the duty of each Offeror to obtain any and all addenda and failure of an Offeror to receive any addendum will not release him from any obligation under his Proposal. However, if any Offeror fails to receive any addendum, and his offer is otherwise determined to represent the best value to the Owner, the contract may be awarded to him and the changes in the work set out in the addendum will be incorporated into the contract by a change order, with a corresponding adjustment in the contract price to be made as provided in the General Conditions of the Contract.

Article VIII. Award of Contract:

1. Owner reserves the right to reject any or all Proposals. There will be no contractual obligations on the part of the Owner to any Offeror, nor will any Offeror have any property interest or other right in the contract or Work being proposed unless and until the contract is unconditionally executed and delivered by all parties, and all conditions to be fulfilled by the Offeror have either been so fulfilled by the Offeror or waived in writing by the Offeror or waived in writing by the Owner.

2. On the proposal due date, the District will receive, publicly open, and read aloud the names of the Offerors and any monetary proposals made by the Offerors. Within a reasonable time, not to exceed forty five (45) days after the date of opening the proposals, the District will select the Offeror that submits the proposal that offers the best value for the District based on the selection criteria in the request for proposal and its ranking evaluation.

3. Thereafter, the District representatives will attempt to negotiate an agreement with the selected Offeror. During such negotiation, the District representatives and its Architects or Architects may discuss with the selected Offeror options for a scope or time modification and any price change associated with the modification. If the District is unable to negotiate a contract with the first selected Offeror, the District will, formally and in writing, end negotiations with that Offeror and proceed to the next Offeror in the order of the selection ranking until a contract is reached or all proposals are rejected.

4. Upon reaching an agreement as to the terms of the Contract with the selected Offeror, the District representatives will make a recommendation to the Board of Trustees that it enter into a contract with the selected Offeror.

5. If the agreement and the selected Offeror is approved by the Board of Trustees, the selected Offeror shall, within ten (10) days after notice that its proposal has been accepted execute the negotiated contract for construction with the Owner and shall furnish the Performance and Payment Bonds described below, in forms acceptable to the Owner.

Article IX. Performance and Payment Bonds:

1. As a political sub-division of the state, the District is required to obtain both performance and payment bonds. Performance bonds are required when the entire transaction (both original amount
and the total of all changes, updates and additions) total over $100,000. Payment bonds are required when the entire transaction (both original amount and the total of all changes, updates and additions) total over $25,000. Neither bond is required to be submitted with the original proposal submission; however, the Selected Offeror will be required to furnish a Performance Bond and/or a Payment Bond, as applicable, on forms acceptable to the Owner, at the time of execution of the Construction Contract and shall include the premium for such bonds in his or her monetary proposal.

2. Such bonds must be written by a Company, or companies, acceptable to and approved by Owner. Owner will not accept a bond written by any company which does not meet all of the following requirements:
   a. The bond must be executed by a corporate surety or corporate sureties duly authorized and admitted to do business in the State of Texas and licensed by the State of Texas to issue surety bonds.
   b. The surety or sureties executing such bond must be listed in the most current issue of the U.S. Department of Treasury Circular 570 (hereinafter called "Circular 570") as an acceptable surety to execute bonds for federal projects.
   c. The amount for which the bond is written shall not exceed the underwriting limitation prescribed by Circular 570 for the surety or sureties executing such bond.

Article X. Wage Scale:

1. The construction of this Project is subject to Chapter 2258 of the Texas Government Code. Among other things, this Chapter provides that it shall be mandatory for a Contractor, and upon any subcontractor under him, to pay not less than the prevailing rates of per diem wages in the locality at the time of construction to all laborers, workmen, and mechanics employed by them in the execution of the contract.

2. In accordance therewith, the Owner has established a scale of prevailing wages which is attached as RCSP Appendix B, and not less than this established scale must be paid on the Project. Any workers not included in the schedule shall be properly classified and paid not less than the rate of wages prevailing in the locality of the work at the time of construction.

Article XI. Insurance and Indemnity:

1. If selected, Offeror will be required to comply with the following Insurance and Indemnification Requirements below:
   a. Insurance: The Agreement which the successful Offeror will be asked to enter into will contain a requirement that it shall provide and maintain certain insurance as required by District, including, but not limited to general liability, automobile liability, and workers' compensation insurance. Such insurance shall be written for not less than the limits set out in the General Conditions of the Contract for Construction, AIA Document A201-2007 as amended by the Owner attached hereto as RCSP Appendix A-2, or greater if required by law, and will comply with the requirements stated therein.
   b. Indemnification. The Agreement which the successful Offeror will be asked to enter into will contain the Indemnity provisions in the General Conditions of the Contract for Construction, AIA Document A201-2007 as amended by the Owner attached hereto as RCSP Appendix A-2. These provisions relating to indemnification of the Owner constitute non-negotiable portions of the Agreement.
Article XI. Independent Contractor:

1. Offeror agrees and understands that, if selected, it and all persons designated by it to provide services in connection with a contract shall be deemed to be independent contractor(s), responsible for their respective acts or omissions, and that District shall in no way be responsible for Offeror’s actions, and that none of the parties hereto will have authority to bind the others or to hold out to third parties, that it has such authority.

Article XII. Criminal Background Checks:

1. Criminal History Record Information. If Consultant is awarded a contract it may be required to obtain all required national Criminal History Record Information (“CHRI”), pursuant to Texas Education Code section 22.0834 and Texas Government Code 411.082(a), on all employees, sub-consultants of every tier, sub-consultant’s employees, independent contractors, applicants, agents, or consultants, if (1) the person will have continuing duties related to the Project and (2) the duties are or will be performed on Owner’s property and the person(s) will or may have direct contact with students (“Covered Employee”). Consultant shall assume all expenses for obtaining CHRI, if required. Any Covered Employee shall be disqualified and prohibited from performing any contract duties or services if that that Covered Employee has been convicted of one of the following offenses, if at the time of the offence the victim was under eighteen (18) or enrolled in a public school: (a) a felony offense under Title 5, Texas Penal Code; (b) an offense for which a defendant is required to register as a sex offender under Chapter 62, Texas Code of Criminal Procedure; or (c) an equivalent offense to (a) or (b) under federal law or the laws of another state (“Disqualifying Criminal History”). The Consultant will be required to certify to the District in writing that it has complied with this section and that none of its Covered Employees have a Disqualifying Criminal History on a form provided by the District. Consultant agrees that if it receives information that a Covered Employee is arrested or convicted for any of the Disqualifying Criminal History offenses during the performance of this contract, Consultant will immediately remove the Covered Employee from Owner’s property or other location where students are regularly present, and notify the Owner of said removal within three (3) days of doing so. Consultant understands that any failure to comply with the requirements of this section may be grounds for termination of its contract with the District. Instructions for complying with CHRI requirements will be made available by the District at the time the contract is executed.
RCSP ATTACHMENT A-1
OFFEROR'S PROPOSAL-ALL PROJECTS

TO: BOARD OF TRUSTEES FT. SAM HOUSTON INDEPENDENT SCHOOL DISTRICT

This Proposal is submitted by _____________________________________, whose address is ________________________________________, (hereafter called "Offeror"), for the following:

**Base Bid 1 - Proposal:**

**RENOVATION AND ADDITION TO FT. SAM HOUSTON ELEMENTARY SCHOOL – APPROXIMATELY 6,790 SQUARE FEET OF RENOVATION AREA AND 19,559 SQUARE FEET OF BUILDING ADDITION**

Offeror agrees to furnish for the total sum of ______________________ Dollars ($ ________), all labor, services, materials, tools, equipment and supervision necessary to the full and final completion of the project, and everything incidental thereto, as shown on the Drawings and/or stated in the Specifications, or property inferable therefrom, all in accordance with the Contract Documents governing the construction of the project prepared by SHW Group now STANTEC. ("Architects").

**Base Bid 2 - Proposal:**

**RENOVATION OF FORMER CAFETERIA SPACE INTO CLASSROOMS – APPROXIMATELY 8,418 SQUARE FEET.**

Offeror agrees to furnish for the total sum of ______________________ Dollars ($ ________), all labor, services, materials, tools, equipment and supervision necessary to the full and final completion of the project, and everything incidental thereto, as shown on the Drawings and/or stated in the Specifications, or property inferable therefrom, all in accordance with the Contract Documents governing the construction of the project prepared by SHW Group now STANTEC. ("Architects").

**Alternate 1 – Proposal:**

**Window Replacement at Ft. Sam Houston Elementary School:** Replacement of existing windows with new windows and structural upgrades/reinforcements to accommodate the new windows. New windows and structural upgrades/reinforcement will require adherence to the federal government design standards of Anti-Terrorism Force Protection guidelines. Includes associated asbestos abatement.

Offeror agrees to furnish for the total sum of ______________________ Dollars ($ ________), all labor, services, materials, tools, equipment and supervision necessary to the full and final completion of the project, and everything incidental thereto, as shown on the Drawings and/or stated in the Specifications, or property inferable therefrom, all in accordance with the Contract Documents governing the construction of the project prepared by SHW Group now STANTEC. ("Architects").
Offeror represents that, prior to preparing this Proposal, he or she has carefully read the Contract Documents, examined the site of the Project, and had made an investigation such that he or she is fully informed of the conditions, facilities, difficulties, restrictions and requirements which he will, or may encounter in the completion of the Project in accordance with the terms of the Contract Documents.

☐ Offeror acknowledges receipt of Addenda Nos. _____ through _____ and that the Proposals contained herein are offered in after review and consideration of same.

☐ To the best of the Offeror’s knowledge no Addenda have been issued.

The Offeror proposes the following substitutions, if any, to the Technical Specifications requested by the District:

Executed on ___________________________, 2014.

Offeror: ________________________________
[Provide full name and business structure of Offeror]

______________________________
Signature

______________________________
Printed Name, Title

Note: If Offeror is a Joint Venture, an authorized signature from a representative of each party is required
RCSP ATTACHMENT B
OFFEROR QUESTIONNAIRE

1. **Company Information**: Provide the following information regarding your company.

   Name/Name of Agency/Company: ________________________________
   Address: _____________________________________________________
   State: _______ Zip Code: _______ Telephone: __________ Fax: __________

2. **Contact Information**: List the person who the District may contact concerning your proposal or setting dates for meetings.

   Name: ________________________________
   Address: _____________________________________________________
   State: _______ Zip Code: _______ Telephone: __________ Fax: __________

3. Does your Company anticipate any mergers, transfer of organization ownership, management reorganization, or departure of key personnel within the next twelve (12) months that may affect the organization’s ability to carry out its proposal?

   Yes ☐ No ☐

4. Is your Company authorized and/or licensed to do business in Texas?

   Yes ☐ No ☐

5. Provide any other names under which your business has operated within the last 5 years.

6. **Debarment/Suspension Information**: Has the Company or any of its principals been debarred or suspended from contracting with any public entity?

   Yes ☐ No ☐

   If yes, identify the public entity and the name and current phone number of a representative of the public entity familiar with the debarment or suspension, and state the reason for or circumstances surrounding the debarment or suspension, including but not limited to the period of time for such debarment or suspension.

7. **Surety Information**: Have you or the Company ever had a bond or surety canceled or forfeited?

   Yes ☐ No ☐

   If yes, state the name of the bonding company, date, amount of bond and reason for such cancellation or forfeiture.
8. **Bankruptcy Information:** Have you or the Company ever been declared bankrupt or filed for protection from creditors under state or federal proceedings?

   Yes ☐ No ☐

   If yes, state the date, court, jurisdiction, cause number, amount of liabilities and amount of assets.

9. **Contractor Default.** Have you or the Company defaulted and been removed from any construction Project in the last ten (10) years.

   Yes ☐ No ☐

   If yes, state the name and address of the individual or entity with whom the Project was contracted, the name of the Project, the date of removal and the reason for removal.

10. **Experience.**
   a) Past Experience on Similar Projects: Identify the three most significant clients (whether school district or non-school district projects) for which the Proposer has provided services similar to the Scope of Services requested by this RCP, within the past 5 years. Include a brief description of the services provided, the results/impact of the work performed, the dates of service, and a point of contact with name, address, and current fax, email, and phone number.

   b) Past Experience with the District. Has the Offeror performed work for the Ft. Sam Houston Independent School District within the last 3 years? If so, indicate if the work performed was as a prime contractor or as a subcontractor, the Project on which the work was performed, describe the work performed and the date performed.

   c) Recent Experience. What Projects, if any, of a similar size and nature has Offeror acted as General Contractor or Construction Manager in the last twelve (12) months.


12. **Scheduling Ability/On Time Completion.** Provide 3 examples of Projects on which your scheduling abilities resulted in a Project being completed on time, in the face of unforeseen delays.

13. **Key Personnel.** Provide brief resumes (2 page limit) for the persons listed below:

   A. Principals/ Corporate Officers:
      i. President
      ii. Vice President
      iii. Partners

   B. Project Management Candidates
      i. Project Manager
      ii. Superintendent
For the Project Manager and Superintendent candidates, please list up to three persons you consider qualified for the positions and the last three projects they worked on along with an Owner contact for these projects. Please also provide a list of the principal duties and responsibilities you anticipate assigning to the Project Manager and to the Superintendent.

14. **Resources and Stability.**

Provide information on available resources, including total number of employees, number and location of offices, number and types of equipment available to support this Project.

Provide three financial references which can verify the financial stability of the firm.

15. **Organization**

A. Describe the most common problem or challenge which you have encountered in school construction and your method for addressing the issue. (Maximum ½ page).

B. Describe your firm’s concepts for working in a team relationship with the Owner and Architect during the design and construction of major projects (Maximum ½ Page).

C. Explain in detail how your firm will handle warranty issues.

D. List the classifications of work or trades which you anticipate performing with in-house forces.

16. **Confirmations.**

A. Provide a statement that the Offeror is able to meet the insurance requirements and provide Certificates of Insurances as specified in the General Conditions of the Contract for Construction AIA Document A201-2007, as amended by Owner attached hereto as Appendix A-2

B. By responding to this RCSP, the Offeror agrees to the contract provisions contained the documents attached as Appendix A1 and A-2. Please delineate below, any comments or requested changes and include an explanation for the requested change, otherwise Offeror will be deemed to have accepted the form of the contract. The final contract is subject to review and approval of the FSHISD legal counsel.

C. At the conclusion of the Project, Contractor will execute the following documents. If Contractor has any objection to executing any of these documents, it must be noted in Respondent’s response to this RFP:

- Appendix C, Affidavit of Non-Use of Asbestos
- Appendix D, Contractor’s Lead-Free Affidavit
- Appendix E, Contractor/Material Supplier’s Affidavit
- Appendix F, Affidavit of Non-Use of Urea-Formaldehyde
- Appendix G, Contractor’s Affidavit
RCSP Attachment C
FELONY CONVICTION NOTIFICATION

Texas Education Code, Section 44.034, Notification of Criminal History, Subsection (a), states “a person or business entity that enters into a contract with a school district must give advance notice to the district if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony.”

Subsection (b) states “a school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The district must compensate the person or business entity for services performed before the termination of the contract.”

This notice is not required of a Publicly-Held Corporation.

I, the undersigned agent for the firm named below, certify that the information concerning notification of felony conviction has been received by me and the following information furnished is true to the best of my knowledge.

Vendor’s Business Name

Authorized Company Official’s Name (Printed)

A. My firm is a publicly-held, stock-exchange corporation, therefore this requirement is not applicable.

Signature of Company Official: ___________________________
Date Signed: ___________________________

B. My firm is not owned or operated by anyone who has been convicted of a felony.

Signature of Company Official: ___________________________
Date Signed: ___________________________

C. My firm is owned or operated by the following individual(s) who has/have been convicted of a felony (printed name and general description of type of felony or felonies):

1. ___________________________

2. ___________________________

3. ___________________________

4. ___________________________

Signature of Company Official: ___________________________
Date Signed: ___________________________
RCSP Attachment D
NON-COLLUSION STATEMENT

______________________________, being first duly sworn, deposes and says this:

(1) He is ________________________________ of ________________________________
    (a partner or officer) (the firm of, etc.)

the Offeror who has submitted the attached Proposal.

(2) He is fully informed respecting the preparation and contents of the attached Proposal and of all
pertinent circumstances respecting such Proposal.

(3) That Proposal is genuine and is not a collusive or sham Proposal.

(4) Neither the said Offeror nor any of its officers, partners, owners, agents, representatives,
employees or parties in interest, including this affiant, has in any way colluded, conspired, connived
or agreed, directly or indirectly, with another Offeror, firm or person, to submit a collusive or sham
Proposal in connection with the Contract for which the attached Proposal has been submitted or to
refrain from proposing in connection with such Contract, or has in any manner, directly or indirectly,
sought by agreement or collusion, or communication or conferences, with any other Offeror, firm or
person to fix the price or prices with the attached Proposal or of any other Offeror, or to secure
through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Ft.
Sam Houston Independent School District Texas or any person interested in the proposed contract;
and,

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

(Offeror’s Business Name): ________________________________

(Offeror’s Representative Signature) ________________________________

(Offeror’s Representative Title) ________________________________

Subscribed and sworn to before me on this ___________ day of ________________, 2014.

_____________________________________
NOTARY PUBLIC, STATE OF TEXAS
Check (✓) the box that indicates business structure of Offeror.

□ Individual/Sole Proprietorship  □Partnership or Joint Venture  □ Corporation  □ Other Entity (State Type)

The undersigned certifies that (s)he is ____________________ (title) of the Offeror entity named below; that (s)he is authorized to sign this Proposal Form (if a Corporation then by resolution with Certified Copy of resolution attached) for and on behalf of the entity, if any, named below, and that (s)he is authorized to execute same for and on behalf of and bind said entity to the terms and conditions provided for in the Proposal as required by this RCSP, and has the requisite authority to execute an Agreement on behalf of Offeror, if awarded, and that the 11-digit Comptroller’s Taxpayer Number for the entity, if any, is:

__________________________
11-digit Comptroller’s Taxpayer Number

__________________________
Employer Identification Number

Offeror Organization Name

By: ____________________________

Printed Name: ____________________________

Title: ____________________________

Note: If Offeror is a Joint Venture, an authorized signature from a representative of each party is required.)

By signing this Signature Page and Declaration of Compliance, I do hereby declare that I have read the Request for Competitive Sealed Proposals, on which our Proposal is submitted with full knowledge of the requirements, and do hereby agree to furnish all services in full accordance with the requirements outlined in the Request for Competitive Sealed Proposals.

By signing and executing this Proposal, I further certify on behalf of my organization and represent to the Ft. Sam Houston Independent School District that Offeror has not offered, conferred or agreed to confer any pecuniary benefit, as defined by TEXAS PENAL CODE ANN.§ 218, or any other thing of value, as consideration for the receipt of information or any special treatment or advantage relating to this Proposal; the Offeror also certifies and represents that Offeror has not offered, conferred or agreed to confer a pecuniary benefit or other things of value as consideration for the recipient's decision, opinion, recommendation, vote or other exercise of discretion concerning this proposal; the Offeror certifies and represents that Offeror has neither coerced nor attempted to influence the exercise of discretion by any officer, trustee, agent or employee of the Ft. Sam Houston Independent School District concerning this Proposal on the basis of any consideration not authorized by law; the Offeror also certifies and represents that Offeror has not received any information not available to other Offeror so as to give the undersigned a preferential advantage with respect to this proposal; the Offeror further certifies and represents that Offeror has not violated any state, federal or local law, regulation or ordinance relating to bribery, improper influence, collusion or the like and that Offeror will not in the future offer, confer, or agree to confer a pecuniary benefit or other thing of value to any officer, trustee, agent or employee of the Ft. Sam Houston Independent School District in return for the person exercising the person's official discretion, power or duty with respect to this Proposal; the Offeror certifies and represents that it has not nor will not in the future offer, confer, or agree to confer a pecuniary benefit or other thing of value to any officer, trustee, agent or employee of the Ft. Sam Houston Independent School District in connection with information regarding this Proposal, the submission of this Proposal, the award of this Proposal or the performance, delivery or sale pursuant to this Proposal.

INSTRUCTIONS TO OFFERORS
RCSP Appendix A-1
Standard Form of Agreement Between Owner and Contractor
Where The Basis Of Payment Is A Stipulated Sum,
AIA Document A101-2007, as amended by Owner
RCSP Appendix A-2
General Conditions of the Contract for Construction
AIA Document A201-2007, as amended by Owner
RCSP Appendix B
Prevailing Wage Rates

The Projects which are the subject of this RCSP are funded in whole or in part by Federal Funding. Contractor shall comply with prevailing wage rate and all federal laws associated with such payments. The General Decision for Wage Rates for the Project follows.

General Decision Number: TX140002 06/20/2014  TX2
Superseded General Decision Number: TX20130002
State: Texas
Construction Type: Building
County: Bexar County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes and apartments up to and including 4 stories). (Use current heavy & highway general wage determination for Paving & Utilities Incidental to Building Construction).

Modification Number | Publication Date |
---------------------|------------------|
0                   | 01/03/2014       |
1                   | 03/07/2014       |
2                   | 06/20/2014       |

ASBE0087-001 01/01/2014
Asbestos/Insulator Worker
(Includes application of all insulating materials, protective coverings, coatings, and finishings to all types of mechanical systems.)

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<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
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<td>$21.17</td>
<td>8.77</td>
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BRTX0001-004 05/01/2011
BRICKLAYER

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<td>$24.50</td>
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* ELEC0060-001 06/02/2014
CABLE SPLICER

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ELECTRICIAN

<table>
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<tbody>
<tr>
<td>$26.00</td>
<td>4.65+10%</td>
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ELEC0060-002 06/01/2009
ELECTRICIAN (Low Voltage including pulling & installing cable through conduit)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>$19.51</td>
<td>8%+4.92</td>
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<tr>
<td>Category</td>
<td>Rate</td>
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<td>-----------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Elevator Constructor</td>
<td></td>
</tr>
<tr>
<td>MECHANIC</td>
<td>$35.89</td>
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<tr>
<td><strong>FOOTNOTE:</strong> A. 6% under 5 years based on regular hourly rate for all hours worked. 8% over 5 years based on regular hourly rate for all hours worked.</td>
<td></td>
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<tr>
<td>Power equipment operators:</td>
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<tr>
<td>Cranes</td>
<td>$29.75</td>
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<tr>
<td>Ironworker (Excluding metal building erectors)</td>
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<tr>
<td>Structural</td>
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<tr>
<td>Tile setter</td>
<td>$18.50</td>
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<tr>
<td>Plumbers and Pipefitters (Including HVAC WORK)</td>
<td>$29.78</td>
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<tr>
<td>Sprinkler Fitter (Fire Sprinklers)</td>
<td>$26.36</td>
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<td>Sheet metal worker (Including HVAC Duct Work)</td>
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### Rates and Fringes

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<tr>
<td>CARPENTER (Excluding Acoustical Ceiling Installer &amp; Drywall Hanger)</td>
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<tr>
<td>CEMENT MASON/CONCRETE FINISHER</td>
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<td>DRYWALL HANGER</td>
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<td>GLAZIER</td>
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<td>IRONWORKER (Excluding Metal Building Assemblers) Reinforcing</td>
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<td>Laborers: Mason Tenders</td>
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<tr>
<td>Mortar Mixers</td>
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<tr>
<td>PLASTERER'S TENDERS</td>
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<tr>
<td>Unskilled</td>
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<td>LATHER</td>
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<tr>
<td>PAINTER (Excluding Tapers/Finishers)</td>
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<tr>
<td>PLASTERER</td>
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<tr>
<td>Power equipment operators:</td>
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<tr>
<td>Front End Loader</td>
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<td>Roofers</td>
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<td>Waterproofers</td>
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<td>Sheet Metal Worker Other Work</td>
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<td>Taper/Finisher</td>
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</tr>
<tr>
<td>TRUCK DRIVER</td>
<td>$ 7.25</td>
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</tr>
</tbody>
</table>

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**WELDERS** - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5 (a) (1) (ii)).

---

**INSTRUCTIONS TO OFFERORS**
The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters, PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union majority rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office.
for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION
Affidavit Of Non-Use Of Asbestos

STATE OF TEXAS
COUNTY OF __________

The undersigned Contractor hereby certifies and affirms that the building materials used for construction by the Contractor or any person or firm representing or represented by the Contractor, do not contain any asbestos materials or any other prohibited materials as defined by laws, rules and regulations promulgated by the Federal Government, The State of Texas, and any governmental organization operating under these entities, except when specifically authorized in writing by the Owner. A copy(s) of that (those) authorizations, if any, is (are) attached.

The undersigned Contractor hereby certifies and affirms that the Contractor shall be totally responsible for any and all costs incurred in removing any asbestos or prohibited materials determined to be part of the building materials as a result of inspection and sample analysis performed by individuals of firms certified to perform asbestos prohibited materials inspection and sample analysis under the laws, rules and regulations of the Federal Government and the State of Texas.

The undersigned Contractor hereby certifies and affirms that the Contractor shall pay for any and all damages resulting from the inability of the Owner to comply with all laws, rules and regulations governing the Asbestos Hazard Emergency Response Act of 1987, and all other laws, rules and regulations governing public buildings.

________________________________________________________________________

Signature

Print Name and Title

Company Name

Before me personally, a Notary Public, on this day appeared ________________________, and who, after being sworn, deposes and says that the facts stated in the above certification are true.

IN WITNESS WHEREOF,
the undersigned authority has signed and sealed this instrument this the _____ day of ________________________, 2014.

________________________________________________________________________

Notary Public for the State of Texas

Notary Seal:

Printed Name of Notary Public

My Commission Expires: _________________________
RCSP Appendix D
Contractor’s Lead Free Affidavit

STATE OF TEXAS
COUNTY OF __________

I understand that in order to protect students, staff, and public in general from any unnecessary exposure to lead, and to comply with the latest Federal and State regulations, the use of lead containing materials and equipment in all forms in the construction operation of this facilities is prohibited.

I certify that I am familiar with the materials used in the construction of, and incorporated into, the construction described below. I further certify that no lead containing materials were used in the process of constructing or incorporated into the construction of all piping and equipment related to potable drinking water.

School: _______________________________________

Job Description: _______________________________________

_______________________________________

Contractor: _______________________________________

Contractor’s Signature: _______________________________________

Date: _______________________________________

Failure to complete this certificate constitutes non-compliance with the job specifications and an unacceptable job.

Before me personally, a Notary Public, on this day appeared _____________________________, and who, after being sworn, deposes and says that the facts stated in the above certification are true.

IN WITNESS WHEREOF, the undersigned authority has signed and sealed this instrument this _____day of __________, 2014

______________________________________________for the State of Texas
Notary Public

Notary Seal:

______________________________________________
Printed Name of Notary Public

My Commission Expires: _________________________
RCSP Appendix E
Contractor’s / Material Supplier’s Affidavit

STATE OF TEXAS
COUNTY OF __________

Before me personally, a Notary Public, on this day appeared ______________________, personally known to me to be the person whose name is subscribed hereto, and who, upon his oath deposes and says as follows:

That he, as Contractor/and or material supplier, furnished certain labor and materials which form a part of certain improvements constructed on the following property, to wit:___________

and that he personally knows that all bills for materials furnished and labor performed in connection with his subcontract/purchase order on the improvements constructed on the above described property have been fully paid.

He further covenants and guarantees that there are no other person or firms whatsoever (materials, suppliers, laborers, or others in any way involved in the furnishing of goods and/or work or labor on his Contractor and/or materials purchase order) heretofore had, now have, or may hereafter be entitled to any liens or claims against the above set out property.

He does further agree to hold the Owner wholly harmless and/or fully indemnify them against any and all liens, claims or demands of any or every kind and nature which may in any way arise out of the furnishing of any of the materials, labor or other services or products in connection with my subcontract and/or supplier or materials.

______________________________
Signature

______________________________
Print Name and Title

______________________________
Company Name

IN WITNESS WHEREOF, the undersigned authority has signed and sealed this instrument this _________day of __________________, 2014.

______________________________ for the State of Texas
Notary Public Signature

Notary Seal:

______________________________
Printed Name of Notary Public

My Commission Expires: _________________________
RCSP Appendix F
Affidavit Of Non-Use Of Urea-Formaldehyde

STATE OF TEXAS
COUNTY OF ________

The undersigned Contractor hereby certifies and affirms that the building materials used for construction by
the Contractor or any person or firm representing or represented by the Contractor, do not contain any urea-
formaldehyde materials or any other prohibited materials as defined by laws, governmental organization
operating under these entities, except when specifically authorized in writing by the Owner. A copy(s) of that
(those) authorization (s), if any is (are) attached.

The undersigned Contractor hereby certifies and affirms that the Contractor shall be totally responsible for
any and all costs incurred in removing any urea-formaldehyde or prohibited materials determined to be part of
the building materials as a result of inspection and sample analysis performed by individuals or firms certified
to perform asbestos prohibited materials inspection and sample analysis under the laws, rules and regulations
of the Federal Government and the State of Texas.

The undersigned Contractor hereby certifies and affirms that the Contractor shall pay for any and all damages
resulting from the inability of the Owner to comply with all laws, rules and regulations governing public
buildings.

____________________________________________
Signature

____________________________________________
Print Name and Title

____________________________________________
Company Name

IN WITNESS WHEREOF, the undersigned authority has signed and sealed this instrument this
____________day of __________________, 2014.

____________________________________________for the State of Texas
Notary Public Signature

Notary Seal:

____________________________________________
Printed Name of Notary Public

My Commission Expires: ______________________
STATE OF TEXAS
COUNTY OF ________

FROM: ____________________________________________
(Name of Contractor)

_______________________________________
(Name of Owner)

RE: The Contract entered into the _______ day of ________________ 2014, between the

above mentioned parties for the construction of ______________________________________

1. The undersigned hereby certifies that all work required under the above contract has been performed
in accordance with the terms thereof, that all material, men, Contractors, mechanical and laborers
have been paid and satisfied in full, and that there are no outstanding claims of any character arising
out of the performance of the Contract which have not been paid and satisfied in full.

2. The undersigned further certifies that there are no unsatisfied claims for damages resulting from injury
or death to any employees, Contractors, or the public at large arising out of the performance of the
Contract, any suite or claims for any other damage of any kind, nature, or description which might
constitute a lien upon the property of the Owner.

3. The undersigned makes this affidavit as specified for the purpose of receiving final payment. In
exchange for Final Payment, Contractor releases Owner from any and all claims arising under or by
virtue of the Contract.

Name of Contractor: ____________________________________________

Authorized Signature: ____________________________________________

Title: ____________________________________________

Before me personally, a Notary Public, on this day appeared ______________________, and who, after
being sworn, deposes and says that the facts stated in the above certification are true.

IN WITNESS WHEREOF, the undersigned authority has signed and sealed this instrument this

_______ day of ________________, 2014.

_______________________________________ for the State of Texas
Notary Public

Notary Seal:

_______________________________________
Printed Name of Notary Public

My Commission Expires: _________________________
GEOTECHNICAL ENGINEERING STUDY

FOR

FORT SAM HOUSTON ISD
EARLY CHILDHOOD CENTER
SAN ANTONIO, TEXAS
Project No. ASA13-036-00  
July 16, 2013

Mr. Daniel Perez, AIA  
SHW Group  
1344 South Flores, Suite 201  
San Antonio, Texas 78204

RE: Geotechnical Engineering Study  
Fort Sam Houston ISD  
Early Childhood Center  
San Antonio, Texas

Dear Mr. Perez:

RABA KISTNER Consultants Inc. (RKCI) is pleased to submit the report of our Geotechnical Engineering Study for the above-referenced project. This study was performed in accordance with RKCI Proposal No. PSA13-033-00, dated February 12, 2013. The purpose of this study was to drill a boring within the footprint of the proposed Early Childhood Center addition to the elementary school, to perform laboratory testing to classify and characterize subsurface conditions, and to prepare an engineering report presenting foundation design and construction recommendations for the proposed Early Childhood Center addition.

The following report contains our design recommendations and considerations based on our current understanding of the information provided to us. There may be alternatives for value engineering of the foundation systems, and RKCI recommends that a meeting be held with the Owner and design team to evaluate these alternatives.

We appreciate the opportunity to be of service to you on this project. Should you have any questions about the information presented in this report, or if we may be of additional assistance with value engineering or on the materials testing-quality control program during construction, please call.

Very truly yours,

RABA KISTNER CONSULTANTS, INC.

Matthew J. Robbins, E.I.T.  
Graduate Engineer

MJR/GLB/dlc

Attachments

Copies Submitted: Above (3)
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Boring Location Map
Log of Boring
Key to Terms and Symbols
Results of Soil Analyses
Important Information About Your Geotechnical Engineering Report
INTRODUCTION

RABA KISTNER Consultants Inc. (RKCI) has completed the authorized subsurface exploration and foundation analysis for the proposed Early Childhood Center addition to the Ft. Sam Houston ISD Elementary School located on southeast corner of the intersection of Williams Road and Biesenbach Drive in San Antonio, Texas. This report briefly describes the procedures utilized during this study and presents our findings along with our recommendations for foundation design and construction considerations.

PROJECT DESCRIPTION

The facilities being considered in this study include the Early Childhood Center addition to the Ft. Sam Houston ISD Elementary School located on southeast corner of the intersection of Williams Road and Biesenbach Drive in San Antonio, Texas. The proposed single-story building is anticipated to create relatively light structural loads to be carried by the foundation system. It is our understanding that at the time of this study, site grading plans and proposed structural loads were not yet available. We understand that the proposed structure will adjoin the existing elementary school structure, and that the existing structure is supported on a drilled pier foundation with a permanent void space beneath the ground level floor slab.

This report was supplemented by 2 borings drilled for a previous study conducted at the elementary school, RKCI Project No. ASA09-071-00, dated November 13, 2009. The information from the previous study was used to supplement our findings with the single boring drilled for the current project. The locations of the previous borings are presented on Figure 1. Our foundation recommendations reflect our findings based on the current boring as well as the information from the previous study.

LIMITATIONS

This engineering report has been prepared in accordance with accepted Geotechnical Engineering practices in the region of south/central Texas and for the use of SHW Group (CLIENT) and its representatives for design purposes. This report may not contain sufficient information for purposes of other parties or other uses. This report is not intended for use in determining construction means and methods.

The recommendations submitted in this report are based on the data obtained from one boring drilled at this site, our understanding of the project information provided to us, and the assumption that site grading will result in only minor changes in the existing topography. We further assume that the finished floor elevation of the new addition will approximately match the existing finished floor elevation of the existing building. If the project information described in this report is incorrect, is altered, or if new information is available, we should be retained to review and modify our recommendations.

This report may not reflect the actual variations of the subsurface conditions across the site. This is particularly true of this site with respect to the depth of the upper surficial clays. The nature and extent of variations across the site may not become evident until construction commences. The construction process itself may also alter subsurface conditions. If variations appear evident at the time of
construction, it may be necessary to reevaluate our recommendations after performing on-site observations and tests to establish the engineering impact of the variations.

The scope of our Geotechnical Engineering Study does not include an environmental assessment of the air, soil, rock, or water conditions either on or adjacent to the site. No environmental opinions are presented in this report.

If final grade elevations are significantly different from existing grades (more than plus or minus 1 ft), our office should be informed about these changes. If needed and/or if desired, we will reexamine our analyses and make supplemental recommendations.

PREVIOUS STUDIES

RKCI performed a previous geotechnical engineering study at this site in 2009 (RKCI Project No. ASA09-071-00, dated November 13, 2009), the results of which are on file in our office. Our previous data was used as supplementary information in the preparation of this report.

BORINGS AND LABORATORY TESTS

Subsurface conditions at the site were evaluated by 1 boring drilled at the location shown on the Boring Location Map, Figure 1. This location is approximate and distances were measured using a hand-held, recreational-grade GPS locator; tape; angles; pacing; etc. The boring was drilled to an approximate depth of 40 ft below the existing ground surface using a truck-mounted drilling rig. During drilling operations, 11 Split-Spoon samples (with Standard Penetration Tests) were collected.

Each sample was visually classified in the laboratory by a member of our geotechnical engineering staff. The geotechnical engineering properties of the strata were evaluated by the following tests:

<table>
<thead>
<tr>
<th>Type of Test</th>
<th>Number Conducted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content</td>
<td>11</td>
</tr>
<tr>
<td>Atterberg Limits</td>
<td>3</td>
</tr>
<tr>
<td>Percent Passing a No. 200 Sieve</td>
<td>2</td>
</tr>
</tbody>
</table>

The results of all laboratory tests are presented in graphical or numerical form on the boring log illustrated on Figure 2. A key to classification terms and symbols used on the logs is presented on Figure 3. The results of the laboratory and field testing are also tabulated on Figure 4 for ease of reference.

Standard Penetration Test results are noted as “blows per ft” on the boring logs and Figure 4, where “blows per ft” refers to the number of blows by a falling hammer required for 1 ft of penetration into the soil/weak rock. Where hard or dense materials were encountered, the tests were terminated at 50 blows even if one foot of penetration had not been achieved.

Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the request of the Client.
GENERAL SITE CONDITIONS

SITE DESCRIPTION

The project site is a developed land located on southeast corner of the intersection of Williams Road and Biesenbach Drive on the Ft. Sam Houston ISD Elementary school campus in San Antonio, Texas. The site is covered by grass and trees. Existing structures include the elementary school to the south. The topography generally slopes downward toward the east with vertical relief of about 2 to 4 ft across the site. Surface drainage is visually estimated to range from poor to fair.

Although not encountered in our boring the presence of buried structures or remnants from previous development (old foundations, pavements, brick, debris, abandoned utilities, etc.) could be present and should be anticipated during construction.

GEOLOGY

A review of the Geologic Atlas of Texas, San Antonio Sheet, indicates that this site is naturally underlain by fluviatile terrace deposits which are stream bed deposits typically consisting of clays, sands, silts, and gravels. Such deposits can contain point bars, cutbanks, oxbows, and abandoned channel segments associated with variations in stream bed activity. As a result, soil profiles in terrace deposit areas may vary greatly over relatively short distances. Key geotechnical engineering concerns for development supported on this formation are the expansive nature of the clays, the consistency or relative density of the deposits, and the absence/presence as well as thickness of potentially water-bearing gravels.

SEISMIC COEFFICIENTS

Based upon a review of Section 1613 Earthquake Loads – Site Ground Motion of the 2012 International Building Code, the following information has been summarized for seismic considerations associated with this site.

- Site Class Definition (Chapter 20 of ASCE 7): Class C. Based on the soil boring conducted for this investigation, the upper 100 feet of soil may be characterized as very dense soil and soft rock.
- Risk-Targeted Maximum Considered Earthquake Ground Motion Response Accelerations for the Conterminous United States of 0.2-Second Spectral Response Acceleration (5% Of Critical Damping) (Figure 1613.3.1(1)): $S_s = 0.082g$. Note that the value taken from Figure 1613.3.1(1) is based on Site Class B and is adjusted per 1613.3.3 below.
- Risk-Targeted Maximum Considered Earthquake Ground Motion Response Accelerations for the Conterminous United States of 1-Second Spectral Response Acceleration (5% Of Critical Damping) (Figure 1613.3.1(2)): $S_1 = 0.031g$. Note that the value taken from Figure 1613.3.1(2) is based on Site Class B and is adjusted per 1613.3.3 below.
- Values of Site Coefficient (Table 1613.3.3(1)): $F_a = 1.2$
- Values of Site Coefficient (Table 1613.3.3(2)): $F_v = 1.7$
The Maximum Considered Earthquake Spectral Response Accelerations are as follows:

- 0.2 sec, adjusted based on equation 16-37: \( S_{ms} = 0.099 \)
- 1 sec, adjusted based on equation 16-38: \( S_{m1} = 0.052 \)

The Design Spectral Response Acceleration Parameters are as follows:

- 0.2 sec, based on equation 16-39: \( S_{DS} = 0.066 \)
- 1 sec, based on equation 16-40: \( S_{D1} = 0.035 \)

Based on the parameters listed above, Tables 1613.3.5(1) and 1613.3.5(2), and calculations performed using the United States Geological Survey (USGS) website, the Seismic Design Category for both short period and 1 second response accelerations is A. As part of the assumptions required to complete the calculations, a Risk Category of “IV” was selected.

**STRATIGRAPHY**

The subsurface stratigraphy at this site can be described by three generalized strata. Each stratum has been designated by grouping soils that possess similar physical and engineering characteristics. The boring logs should be consulted for more specific stratigraphic information. The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual.

Stratum I consists of very stiff to hard, dark brown clay. These clays are classified as highly plastic with a single measured plasticity index of 54. Measured moisture contents range from 16 to 25 percent. Standard Penetration Test (SPT) N-values range from 16 to 36 blows per ft. This stratum extends to a depth of approximately 6 ft below the existing ground surface in our boring.

Stratum II consists of hard, tan clay with calcareous deposits. These clays are classified as plastic with a single measured plasticity index of 27. Measured moisture contents range from 11 to 13 percent. SPT N-values range from 50 blows per ft to 50 blows for 11 in. of penetration. Based on a single grain size analysis, the percentage of fines (percent passing a No. 200 sieve) was measured at 81 percent. This stratum extends to a depth of approximately 15 ft below the existing ground surface in our boring.

Stratum III consists of hard, tan and gray clay with ferric staining. These clays are classified as highly plastic with a single measured plasticity index of 48. Measured moisture contents range from 17 to 20 percent. SPT N-values range from 38 blows per ft to 50 blows for 9 in. of penetration. This stratum extends to at least the termination depth in our boring.

**GROUNDWATER**

Groundwater was not observed in the boring either during or immediately upon completion of the drilling operations. The boring remained dry during the field exploration phase. At the time of our field study the area of central and south Texas was in the midst of a historic drought. The drought conditions have impacted local groundwater conditions. Therefore, it is possible for groundwater to exist beneath
this site at shallow depths on a transient basis, particularly following periods of precipitation and during periods of more normal rainfall patterns. Fluctuations in groundwater levels occur due to variation in rainfall and surface water run-off. The construction process itself may also cause variations in the groundwater level.

**FOUNDATION ANALYSIS**

**EXPANSIVE SOIL-RELATED MOVEMENTS**

The anticipated ground movements due to swelling of the underlying soils at the site were estimated for slab-on-grade construction using the empirical procedure, Texas Department of Transportation (TxDOT) Tex-124-E, Method for Determining the Potential Vertical Rise (PVR). A PVR value of 4 in. was estimated for the stratigraphic conditions encountered in our boring. A surcharge load of 1 psi (concrete slab and sand layer), an active zone of 15 ft, and dry moisture conditions were assumed in estimating the above PVR values.

The TxDOT method of estimating expansive soil-related movements is based on empirical correlations utilizing the measured plasticity indices and assuming typical seasonal fluctuations in moisture content. If desired, other methods of estimating expansive soil-related movements are available, such as estimations based on swell tests and/or soil-suction analyses. However, the performance of these tests and the detailed analysis of expansive soil-related movements were beyond the scope of the current study. It should also be noted that actual movements can exceed the calculated PVR values due to isolated changes in moisture content (such as due to leaks, landscape watering....) or if water seeps into the soils to greater depths than the assumed active zone depth due to deep trenching or excavations.

**OVEREXCAVATION AND SELECT FILL REPLACEMENT**

To reduce expansive soil-related movements in at-grade construction, a portion of the upper highly expansive subgrade clays in the building area can be removed by overexcavating and backfilling with a suitable select fill material. PVR values have been estimated for overexcavation and select fill replacement to various depths below the existing ground surface and are summarized in the table below. Recommendations for the selection and placement of select backfill materials are addressed in a subsequent section of this report.

<table>
<thead>
<tr>
<th>Depth of Overexcavation and Select Fill Replacement (ft)*</th>
<th>Estimated PVR (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>3-1/4</td>
</tr>
<tr>
<td>2</td>
<td>2-1/4</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1-1/2</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

*below the ground surface elevation existing at the time of our study.
The soils at this site are highly expansive. Due to the previously mentioned issues associated with differential vertical movements between adjoining structures with differing foundation systems, shallow foundation systems using overexcavation and select fill replacement techniques are not considered a viable option for this project.

**Drainage Considerations**

When overexcavation and select fill replacement is selected as a method to reduce the potential for expansive soil-related movements at any site, considerations of surface and subsurface drainage may be crucial to construction and adequate foundation performance of the soil-supported structures. Filling an excavation in relatively impervious plastic clays with relatively pervious select fill material creates a “bathtub” beneath the structure, which can result in ponding or trapped water within the fill unless good surface and subsurface drainage is provided.

Water entering the fill surface during construction or entering the fill exposed beyond the building lines after construction may create problems with fill moisture control during compaction and increased access for moisture to the underlying expansive clays both during and after construction.

Several surface and subsurface drainage design features and construction precautions can be used to limit problems associated with fill moisture. These features and precautions may include but are not limited to the following:

- Installing berms or swales on the uphill side of the construction area to divert surface runoff away from the excavation/fill area during construction;
- Sloping of the top of the subgrade with a minimum downward slope of 1.5 percent out to the base of a dewatering trench located beyond the building perimeter;
- Sloping the surface of the fill during construction to promote runoff of rain water to drainage features until the final lift is placed;
- Sloping of a final, well maintained, impervious clay or pavement surface (downward away from the building) over the select fill material and any perimeter drain extending beyond the building lines, with a minimum gradient of 6 in. in 5 ft;
- Constructing final surface drainage patterns to prevent ponding and limit surface water infiltration at and around the building perimeter;
- Locating the water-bearing utilities, roof drainage outlets and irrigation spray heads outside of the select fill and perimeter drain boundaries; and
- Raising the elevation of the ground level floor slab.

Details relative to the extent and implementation of these considerations must be evaluated on a project-specific basis by all members of the project design team. Many variables that influence fill drainage considerations may depend on factors that are not fully developed in the early stages of design. For this reason, drainage of the fill should be given consideration at the earliest possible stages of the project.
FOUNDATION RECOMMENDATIONS

Previous studies conducted at this site focused on observed building distress localized primarily in and around the front entry/administrative area of the existing building. These movements are obviously related to the expansive soil conditions which exist at this site. These conditions combined with the relatively shallow depth of the existing piers and the very large, mature oak tree located in the front of the building are believed to be at least partially responsible for the building movements and distress. The new addition should be founded on drilled piers and suspended with a permanent void space similar to the existing building but the recommendations are to found the piers for the new building deeper than the original piers to try and reduce any significant expansive soils related movements in the foundation system of the new building addition. While movements are still possible between the existing building and the new addition due to the different pier depths the movements should be easier to accommodate from a structural perspective if only one building is moving and not both of them. The differential movement between the buildings is expected to be in the order of an inch or less provided that no future events occur that create significant, localized soil moisture content fluctuations in the foundation soils in the vicinity of the common walls between the existing building and the new addition.

SITE GRADING

Site grading plans can result in changes in almost all aspects of foundation recommendations. Based on the information provided to us, we understand that site grading plans at this site will include a permanent void space under the ground level floor slab. If site grading plans differ from existing grade by more than plus or minus 1 ft, RKCI must be retained to review the site grading plans prior to bidding the project for construction. This will enable RKCI to provide input for any changes in our original recommendations that may be required as a result of site grading operations or other considerations.

AREA FLATWORK

It should be noted that ground-supported flatwork such as walkways, courtyards, etc. will be subject to the same magnitude of potential soil-related movements as discussed previously (see Expansive Soil-Related Movement section). Thus, where these types of elements abut rigid building foundations or isolated/suspended structures, differential movements should be anticipated. As a minimum, we recommend that flexible joints be provided where such elements abut the main structure to allow for differential movement at these locations. Where the potential for differential movement is objectionable, it may be beneficial to consider methods of reducing anticipated movements or to consider structurally suspending critical areas to match the adjacent building performance.

DRILLED-AND-UNDERREAMED PIERS

Drilled-and-underreamed piers bearing in the Stratum III tan and gray clay may be considered to support the structure. We recommend that piers extend to a minimum depth of 35 ft below the ground surface existing at the time of our study. The minimum founding depth of the piers is recommended due to our previous experience at the elementary school site. We believe the ground related movements that have affected the existing elementary school building are at least partially due to piers not being founded deep enough to accommodate the expansive soil related movements at this site. Care must be taken to
make sure that the construction of the new piers in no way undermines or otherwise adversely impacts the performance of the existing piers since the new piers will be constructed below the depth of the existing piers.

The piers should be designed as end bearing units using a maximum allowable bearing pressure of 15 ksf. This bearing pressure was evaluated using a factor of safety of about 3 with respect to the design shear strength. Based on the 40-ft maximum depth of exploration, pier depth should not exceed a depth of 40 ft below the ground surface existing at the time of our study.

**Pier Shafts**

The pier shafts will be subject to potential uplift forces if the surrounding expansive soils within the active zone are subjected to alternate drying and wetting conditions. The maximum potential uplift force acting on the shaft may be estimated by:

$$F_u = 80 \times D$$

where:

- $F_u$ = uplift force in kips; and
- $D$ = diameter of the shaft in feet.

**Allowable Uplift Resistance**

Resistance to uplift forces exerted on the drilled piers will be provided by the sustained axial compressive force (dead load) plus the allowable uplift resistance provided by the soil. The resistance provided by the soil depends on the bearing capacity of the soils located above the pier underream (bell) and below the active zone. The allowable uplift resistance for underreamed piers founded at the depth recommended above may be estimated using:

$$R_u = 11 \times (B^2 - D^2)$$

where:

- $R_u$ = uplift resistance in kips;
- $B$ = diameter of the underream in feet; and
- $D$ = diameter of the shaft in feet.

We recommend that the bell-to-shaft diameter ratio be a minimum of 2, and not exceed 3. Reinforcing steel will be required in each pier shaft to withstand a net force equal to the uplift force minus the sustained compressive load carried by the pier. We recommend that each pier be reinforced to withstand this net force or an amount equal to 1 percent of the cross-sectional area of the shaft, whichever is greater.
PIER SPACING

Where possible, we recommend that the piers be spaced at a center to center distance of at least three bell-diameters for underreamed piers. Such spacing will not require a reduction in the load carrying capacity of the individual piers.

If design and/or construction restraints require that piers be spaced closer than the recommended three bell diameters, RKCI must re-evaluate the allowable bearing capacities presented above for the individual piers. Reductions in load carrying capacities may be required depending upon individual loading and spacing conditions. As previously noted care must be taken to insure that the construction of the new (deeper) piers does not adversely impact the performance of the existing shallower piers.

GRADE BEAMS

We recommend that the grade beams interconnecting the piers be structurally suspended due to the anticipated ground movements. A positive void space of at least 12 in., preferably more, should be provided between the soffits of grade beams and the underlying soils.

ADDITIONAL CONSIDERATIONS

As with any project where new additions are to be connected to an existing structure, differential movements between the existing structure and addition should be anticipated. This is especially true of this site, where expansive clays underlie the site. To reduce possible differential movements, it is typically desirable to match the old and the new foundation types. However, this will not eliminate the potential for differential movements since the existing and new structures are constructed at different times. Therefore, the recommendations and options discussed in this report should be carefully considered by the design team to obtain the desired performance of the new structural system. As a minimum, control/expansion joints are recommended at connection points between the old and new structures and between architectural trim materials along walls/ceilings.

Should excavations adjacent to existing structures be required, precautions should be taken not to undermine or damage existing grade beams, footings, and/or utility lines.

FOUNDATION CONSTRUCTION CONSIDERATIONS

SITE DRAINAGE

Drainage is an important key to the successful performance of any foundation. Good surface drainage should be established prior to and maintained after construction to help prevent water from ponding within or adjacent to the building foundation and to facilitate rapid drainage away from the building foundation. Failure to provide positive drainage away from the structure can result in localized differential vertical movements in soil supported foundations and floor slabs (which can in turn result in cracking in the sheetrock partition walls, and shifting of ceiling tiles, as well as improper operation of windows and doors).
Current ordinances, in compliance with the Americans with Disabilities Act (ADA), may dictate maximum slopes for walks and drives around and into new buildings. These slope requirements can result in drainage problems for buildings supported on expansive soils. We recommend that, on all sides of the building, the maximum permissible slope be provided away from the building.

Also to help control drainage in the vicinity of the structure, we recommend that roof/gutter downspouts and landscaping irrigation systems not be located adjacent to the building foundation. Where a select fill overbuild is provided outside of the floor slab/foundation footprint, the surface should be sealed with an impermeable layer (pavement or clay cap) to reduce infiltration of both irrigation and surface waters. Careful consideration should also be given to the location of water bearing utilities, as well as to provisions for drainage in the event of leaks in water bearing utilities. All leaks should be immediately repaired.

Other drainage and subsurface drainage issues are discussed in the *Expansive Soil-Related Movements* section of this report.

**SITE PREPARATION**

The crawl space should be excavated to the planned elevations and dimensions. The exposed subgrade should be proofrolled in order to locate and densify any weak, compressible zones. A minimum of 5 passes of a fully-loaded dump truck or a similar heavily-loaded piece of construction equipment should be used for planning purposes. Proofrolling operations should be observed by the Geotechnical Engineer or his representative to document subgrade condition and preparation. Weak or soft areas identified during proofrolling should be removed and replaced with suitable, compacted on-site clays, free of organics, oversized materials, and degradable or deleterious materials.

A mud slab could be considered for the crawl space of the building addition. This will help to facilitate the below slab drainage and will help to reduce the moisture in the crawl space post construction. The exposed subgrade should be moisture conditioned by scarifying to a minimum depth of 6 in. and recompacting to a minimum of 90 percent (but not in excess of 95%) of the maximum density determined from TxDOT, Tex-114-E, Compaction Test. The moisture content of the subgrade should be maintained within the range of optimum moisture content to 3 percentage points above optimum moisture content until permanently covered. The mud slab should be placed as quickly as possible following the moisture conditioning of the subgrade.

Any areas to support select fill should be stripped of all existing foundations, utilities, vegetation, and organic topsoil. Exposed subgrades should be thoroughly proofrolled in order to locate and densify any weak, compressible zones. A minimum of 5 passes of a fully-loaded dump truck or a similar heavily-loaded piece of construction equipment should be used for planning purposes. Proofrolling operations should be observed by the Geotechnical Engineer or his representative to document subgrade condition and preparation. Weak or soft areas identified during proofrolling should be removed and replaced with suitable, compacted on-site clays, free of organics, oversized materials, and degradable or deleterious materials.
Upon completion of the proofrolling operations and just prior to fill placement or slab construction, the exposed subgrade should be moisture conditioned by scarifying to a minimum depth of 6 in. and recompacting to a minimum of 95 percent of the maximum density determined from TxDOT, Tex-114-E, Compaction Test. The moisture content of the subgrade should be maintained within the range of optimum moisture content to 3 percentage points above optimum moisture content until permanently covered.

**SELECT FILL**

Materials used as select fill for final site grading preferably should be crushed stone or gravel aggregate. We recommend that materials specified for use as select fill meet the TxDOT 2004 Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, Item 247, Flexible Base, Type A or C, Grades 1 through 3.

Soils classified as CH, CL, MH, ML, SM, GM, OH, OL and Pt under the USCS are **not** considered suitable for use as select fill materials at this site. The native soils at this site are **not** considered suitable for use as select fill materials.

Select fill should be placed in loose lifts not exceeding 8 in. in thickness and compacted to at least 95 percent of maximum density as determined by TxDOT, Tex-113-E, Compaction Test. The moisture content of the fill should be maintained within the range of 2 percentage points below to 2 percentage points above the optimum moisture content until final compaction.

**DRILLED PIERS**

Each drilled pier excavation must be examined by an RKCI representative who is familiar with the geotechnical aspects of the soil stratigraphy, the structural configuration, foundation design details and assumptions, prior to placing concrete. This is to observe that:

- The shaft and bell have been excavated to the specified dimensions at the correct depth established by the previously mentioned criteria;
- The bell is concentric with the pier shaft;
- The shaft has been drilled plumb within specified tolerances along its total length; and
- Excessive cuttings, buildup and soft, compressible materials have been removed from the bottom of the excavation.

**Reinforcement and Concrete Placement**

Reinforcing steel should be checked for size and placement prior to concrete placement. Placement of concrete should be accomplished as soon as possible after excavation to reduce changes in the moisture content or the state of stress of the foundation materials. No foundation element should be left open overnight without concreting.
Temporary Casing

Groundwater seepage was not observed in the test boring at the time of our subsurface exploration. However, groundwater seepage and/or side sloughing may be encountered at the time of construction, depending on climatic conditions prevalent at the time of construction. Therefore, we recommend that the bid documents require the foundation contractor to specify unit costs for different lengths of casing that may be required.

EXCAVATION SLOPING AND BENCHING

If utility trenches or other excavations extend to or below a depth of 5 ft below construction grade, the contractor or others shall be required to develop a trench safety plan to protect personnel entering the trench or trench vicinity. The collection of specific geotechnical data and the development of such a plan, which could include designs for sloping and benching or various types of temporary shoring, are beyond the scope of the current study. Any such designs and safety plans shall be developed in accordance with current OSHA guidelines and other applicable industry standards.

EXCAVATION EQUIPMENT

Our boring logs are not intended for use in determining construction means and methods and may therefore be misleading if used for that purpose. We recommend that earth-work and utility contractors interested in bidding on the work perform their own tests in the form of test pits to determine the quantities of the different materials to be excavated, as well as the preferred excavation methods and equipment for this site.

CRAWL SPACE CONSIDERATIONS

It is our understanding that a structurally suspended floor system will be utilized, several special design issues should be considered for the resulting subfloor crawl space. These issues are discussed below.

Ventilation

Observations by members of our firm of open crawl spaces have indicated a need for adequate subfloor ventilation for suspended floor systems. Such ventilation helps promote evaporation of subgrade moisture which may accumulate in spite of special surface and subsurface drainage features. As a minimum, free flowing passive vents may need to be installed along the perimeter beam to provide cross ventilation. If structural configurations will limit the free flow of air through passive vents, forced air, power vents should be installed. All vents should be designed such that they will not allow the drainage of surface water into the crawl space.

Below Slab Utilities

A minimum clearance of 12 in. has been recommended between both the grade beams and floor slab and the underlying finished subgrade should a suspended floor system be employed. Such a minimum
clearance is also recommended between the subgrade and any utilities which may be suspended from the underside of the floor. This clearance will allow swell-related subgrade movements without damaging the utilities. It is recommended that the utility clearance not be provided by the addition of narrow trenches running parallel to and immediately below the utilities, unless proper slopes and drainage outlets are provided to prevent ponding of water in the trenches.

**Drainage**

As discussed throughout this report, positive drainage is a key factor in the long term performance of any foundation. This is not only critical around the perimeter of the structure, but also in any subfloor crawl spaces. In crawl areas, surface drainage should be established that will direct water away from and will prevent water from ponding adjacent to piers. This positive drainage should be maintained both prior to and after construction.

Compaction control of the backfill around the perimeter of the building following the placement of soil retainer blocks is critical to the drainage away from the building following construction. Materials for the backfill around the perimeter of the building should be the on-site clays. These materials should be compacted in uniformly thin lifts (8-inch maximum loose thickness) to at least 90 percent of the maximum dry density as determined by TxDOT Test Method TEX-114-E. These clays should be placed and compacted at optimum to plus 3 percent above optimum moisture content. Compaction by hand operated mechanical tampers will help to avoid damage to the soil retainer blocks. Following backfilling operations the soil retainer blocks should be checked to see that they have not been broken or collapsed during the compaction operations. Any soil retainer blocks that are broken or collapsed should be repaired or replaced.

**Carton Forms**

When carton forms are used to form subfloor void spaces, the forms often get wet or sometimes absorb water from humid air. This can result in collapse of the forms during the placement of concrete, thus diminishing the design void space. Conversely, if the carton forms are too strong and do not decompose sufficiently with time, they may not collapse as soil heave occurs, resulting in heave damage to the floor slab. Where there is sufficient moisture to cause the appropriate deterioration after construction, there may be a resulting moisture problem in the floor slab as a result of poor ventilation and the accumulation of condensation within the resulting unventilated void space. The lack of ventilation may also result in increased soil movements that will diminish the design void space. For these reasons, we recommend that where possible, consideration be given to methods other than the use of carton forms to form the recommended void space beneath floor slabs. If project specifics require the use of carton forms, then as a minimum, care should be taken to ensure that the carton forms are designed for use in the project location, and that carton forms are properly stored, protected, and installed during construction.

**UTILITIES**

Utilities which project through any rigid unit should be designed with either some degree of flexibility or with sleeves. Such design features will help reduce the risk of damage to the utility lines as vertical movements occur.
Our experience indicates that significant settlement of backfill can occur in utility trenches, particularly when trenches are deep, when backfill materials are placed in thick lifts with insufficient compaction, and when water can access and infiltrate the trench backfill materials. The potential for water to access the backfill is increased where water can infiltrate flexible base materials due to insufficient penetration of curbs, and at sites where geological features can influence water migration into utility trenches (such as fractures within a rock mass or at contacts between rock and clay formations). It is our belief that another factor which can significantly impact settlement is the migration of fines within the backfill into the open voids in the underlying free-draining bedding material.

To reduce the potential for settlement in utility trenches, we recommend that consideration be given to the following:

- All backfill materials should be placed and compacted in controlled lifts appropriate for the type of backfill and the type of compaction equipment being utilized and all backfilling procedures should be tested and documented.
- Curbs should completely penetrate base materials and be installed to a sufficient depth to reduce water infiltration beneath the curbs into the pavement base materials.
- Consideration should be given to wrapping free-draining bedding gravels with a geotextile fabric (similar to Mirafi 140N) to reduce the infiltration and loss of fines from backfill material into the interstitial voids in bedding materials.

**CONSTRUCTION RELATED SERVICES**

**CONSTRUCTION MATERIALS TESTING AND OBSERVATION SERVICES**

As presented in the attachment to this report, *Important Information About Your Geotechnical Engineering Report*, subsurface conditions can vary across a project site. The conditions described in this report are based on interpolations derived from a limited number of data points. Variations will be encountered during construction, and only the geotechnical design engineer will be able to determine if these conditions are different than those assumed for design.

Construction problems resulting from variations or anomalies in subsurface conditions are among the most prevalent on construction projects and often lead to delays, changes, cost overruns, and disputes. These variations and anomalies can best be addressed if the geotechnical engineer of record, RKCI is retained to perform construction observation and testing services during the construction of the project. This is because:

- RKCI has an intimate understanding of the geotechnical engineering report’s findings and recommendations. RKCI understands how the report should be interpreted and can provide such interpretations on site, on the client’s behalf.
- RKCI knows what subsurface conditions are anticipated at the site.
- RKCI is familiar with the goals of the owner and project design professionals, having worked with them in the development of the geotechnical workscope. This enables RKCI...
to suggest remedial measures (when needed) which help meet the owner’s and the design teams’ requirements.

- RKCI has a vested interest in client satisfaction, and thus assigns qualified personnel whose principal concern is client satisfaction. This concern is exhibited by the manner in which contractors’ work is tested, evaluated and reported, and in selection of alternative approaches when such may become necessary.

- RKCI cannot be held accountable for problems which result due to misinterpretation of our findings or recommendations when we are not on hand to provide the interpretation which is required.

BUDGETING FOR CONSTRUCTION TESTING

Appropriate budgets need to be developed for the required construction testing and observation activities. At the appropriate time before construction, we advise that RKCI and the project designers meet and jointly develop the testing budgets, as well as review the testing specifications as it pertains to this project.

Once the construction testing budget and scope of work are finalized, we encourage a preconstruction meeting with the selected contractor to review the scope of work to make sure it is consistent with the construction means and methods proposed by the contractor. RKCI looks forward to the opportunity to provide continued support on this project, and would welcome the opportunity to meet with the Project Team to develop both a scope and budget for these services.

*    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *

The following figures are attached and complete this report:

<table>
<thead>
<tr>
<th>Figure 1</th>
<th>Figure 2</th>
<th>Figure 3</th>
<th>Figure 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boring Location Map</td>
<td>Log of Boring</td>
<td>Key to Terms and Symbols</td>
<td>Results of Soil Analyses</td>
</tr>
</tbody>
</table>
ATTACHMENTS
### LOG OF BORING NO. B-101

**Fort Sam Houston ISD**  
**Early Childhood Center**  
**San Antonio, Texas**

**DRILLING METHOD:** Straight Flight Auger  
**LOCATION:** N 29.46872; W 98.39802

<table>
<thead>
<tr>
<th>DESCRIPTION OF MATERIAL</th>
<th>BLOWS PER FT</th>
<th>UNIT DRY WEIGHT, pcf</th>
<th>PLASTICITY INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLAY, Very Stiff to Hard, Dark Brown</td>
<td>16</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>CLAY, Hard, Tan, with calcareous deposits</td>
<td>50/11&quot;</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>CLAY, Hard, Tan and Gray, with ferric staining</td>
<td>50/11&quot;</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

- with gypsum crystals below 38 ft

**DEPTH DRILLED:** 40.0 ft  
**DATE DRILLED:** 6/12/2013  
**DEPTH TO WATER:** DRY  
**DATE MEASURED:** 6/12/2013  
**PROJ. No.:** ASA13-036-00  
**FIGURE:** 2
KEY TO TERMS AND SYMBOLS (CONT’D)

TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

### RELATIVE DENSITY

<table>
<thead>
<tr>
<th>Penetration Resistance Blows per ft</th>
<th>Relative Density</th>
<th>Resistance Blows per ft</th>
<th>Consistency</th>
<th>Cohesion TSF</th>
<th>Plasticity Index</th>
<th>Degree of Plasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td>Very Loose</td>
<td>0 - 2</td>
<td>Very Soft</td>
<td>0 - 0.125</td>
<td>0 - 5</td>
<td>None</td>
</tr>
<tr>
<td>4 - 10</td>
<td>Loose</td>
<td>2 - 4</td>
<td>Soft</td>
<td>0.125 - 0.25</td>
<td>5 - 10</td>
<td>Low</td>
</tr>
<tr>
<td>10 - 30</td>
<td>Medium Dense</td>
<td>4 - 8</td>
<td>Firm</td>
<td>0.25 - 0.5</td>
<td>10 - 20</td>
<td>Moderate</td>
</tr>
<tr>
<td>30 - 50</td>
<td>Dense</td>
<td>8 - 15</td>
<td>Stiff</td>
<td>0.5 - 1.0</td>
<td>20 - 40</td>
<td>Plastic</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>Very Dense</td>
<td>15 - 30</td>
<td>Very Stiff</td>
<td>1.0 - 2.0</td>
<td>&gt; 40</td>
<td>Highly Plastic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 30</td>
<td>Hard</td>
<td>&gt; 2.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ABBREVIATIONS

- **B** = Benzene
- **T** = Toluene
- **E** = Ethylbenzene
- **X** = Total Xylenes
- **BPX** = Total BTEX
- **TPH** = Total Petroleum Hydrocarbons
- **ND** = Not Detected
- **NA** = Not Analyzed
- **NR** = Not Recorded/No Recovery
- **OVA** = Organic Vapor Analyzer
- **ppm** = Parts Per Million
- **Qam, Qas, Qal** = Quaternary Alluvium
- **Qat** = Low Terrace Deposits
- **Qbc** = Beaumont Formation
- **Qt** = Fluviatile Terrace Deposits
- **Qao** = Seymour Formation
- **Qle** = Leona Formation
- **Q-Tu** = Uvalde Gravel
- **Ewi** = Wilcox Formation
- **Emi** = Midway Group
- **Mc** = Catahoula Formation
- **El** = Laredo Formation
- **Kknm** = Navarro Group and Marlbrook Marl
- **Kpg** = Pecan Gap Chalk
- **Kau** = Austin Chalk
- **Kef** = Eagle Ford Shale
- **Kbu** = Buda Limestone
- **Kdr** = Del Rio Clay
- **Kft** = Fort Terrett Member
- **Kgt** = Georgetown Formation
- **Kgr** = Glen Rose Formation
- **Kgru** = Upper Glen Rose Formation
- **Kgrl** = Lower Glen Rose Formation
- **Khe** = Hensell Sand

REVISED 04/2012

FIGURE 3b
KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

SOIL STRUCTURE

Slickensided  Having planes of weakness that appear slick and glossy.
Fissured  Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket  Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting  Inclusion less than 1/8 inch thick extending through the sample.
Seam  Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer  Inclusion greater than 3 inches thick extending through the sample.
Laminated  Soil sample composed of alternating partings or seams of different soil type.
Interlayered  Soil sample composed of alternating layers of different soil type.
Intermixed  Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous  Having appreciable quantities of carbonate.
Carbonate  Having more than 50% carbonate content.

SAMPLING METHODS

RELATIVELY UNDISTURBED SAMPLING

Cohesive soil samples are to be collected using three-inch thin-walled tubes in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587) and granular soil samples are to be collected using two-inch split-barrel samplers in general accordance with the Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1586). Cohesive soil samples may be extruded on-site when appropriate handling and storage techniques maintain sample integrity and moisture content.

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-in.-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARREL SAMPLER DRIVING RECORD

<table>
<thead>
<tr>
<th>Blows Per Foot</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>25 blows drove sampler 12 inches, after initial 6 inches of seating.</td>
</tr>
<tr>
<td>50/7&quot;</td>
<td>50 blows drove sampler 7 inches, after initial 6 inches of seating.</td>
</tr>
<tr>
<td>Ref/3&quot;</td>
<td>50 blows drove sampler 3 inches during initial 6-inch seating interval.</td>
</tr>
</tbody>
</table>

**NOTE:** To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.
### RESULTS OF SOIL SAMPLE ANALYSES

**PROJECT NAME:** Fort Sam Houston ISD  
Early Childhood Center  
San Antonio, Texas

**FILE NAME:** ASA13-036-00 ELEMENTARY SCHOOL.GPJ  
7/9/2013

<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Sample Depth (ft)</th>
<th>Blows per ft</th>
<th>Water Content (%)</th>
<th>Liquid Limit</th>
<th>Plastic Limit</th>
<th>Plasticity Index</th>
<th>USCS</th>
<th>Dry Unit Weight (pcf)</th>
<th>% -200 Sieve</th>
<th>Shear Strength (tsf)</th>
<th>Strength Test</th>
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<tr>
<td>B-101</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0 to 1.5</td>
<td>16</td>
<td>25</td>
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<td></td>
<td></td>
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<tr>
<td>2.5 to 4.2</td>
<td>30</td>
<td>17</td>
<td>73</td>
<td>19</td>
<td>54</td>
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<td>4.5 to 6.2</td>
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<td>6.5 to 8.2</td>
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<td>12</td>
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<td>18.5 to 20.0</td>
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<td>48</td>
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<td>38.5 to 40.0</td>
<td>50/9&quot;</td>
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</tbody>
</table>

**Legend:**  
PP = Pocket Penetrometer  
TV = Torvane  
UC = Unconfined Compression  
FV = Field Vane  
UU = Unconsolidated Undrained Triaxial  
CU = Consolidated Undrained Triaxial  
7/9/2013

**PROJECT NO.** ASA13-036-00

**FIGURE 4**
Important Information about Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. And no one— not even you — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client’s goals, objectives, and risk management preferences; the general nature of the structure involved; its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it’s changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, always inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. Do not rely on a geotechnical engineering report whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report’s Recommendations Are Not Final

Do not overly rely on the construction recommendations included in your report. Those recommendations are not final, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual
subsurface conditions revealed during construction. The geotechnical engineer who developed your report cannot assume responsibility or liability for the report’s recommendations if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject to Misinterpretation
Other design team members’ misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team’s plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer’s Logs
Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance
Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but provide it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report’s accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely
Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled “limitations” or “recommendations,” these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered
The equipment, techniques, and personnel used to perform a geoenvironmental study differ significantly from those used to perform a geotechnical study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated environmental problems have led to numerous project failures. If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. Do not rely on an environmental report prepared for someone else.

Obtain Professional Assistance To Deal with Mold
Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the express purpose of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; none of the services performed in connection with the geotechnical engineer’s study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance
Membership in ASFE/The Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Contact your ASFE-member geotechnical engineer for more information.
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SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section specifies administrative and procedural requirements governing handling and processing allowances.

1. Selected materials and equipment, and in some cases, their installation are shown and specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. Additional requirements, if necessary, will be issued by Change Order.

B. Types of allowances required include the following:
   1. Owner's Contingency Allowance.
   2. Signage and Graphics Allowance.
   3. Landscape Allowance

C. Allowance amounts shall be transferable to other allowances as directed by the Architect.

D. Procedures for submitting and handling Unit Prices are included in Section "Unit Prices".

E. Procedures for submitting and handling Change Orders are included in Section "Modification Procedures."

F. Use of allowances for inspection and testing agencies is included in Section "Quality Control Services."

1.3 SELECTION AND PURCHASE
A. At the earliest feasible date after Contract award, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed in order to avoid delay in performance of the Work.

1. When requested by the Architect, obtain proposals for each allowance for use in making final selections; include recommendations that are relevant to performance of the Work.

2. Purchase products and systems as selected by the Architect from the designated service organization or supplier.

1.4 SUBMITTALS
A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to indicate actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.5 CONTINGENCY ALLOWANCES
A. Use the contingency allowance only as directed for the Owner's purposes, and only by Contingency Fund Change Orders which designate amounts to be charged to the allowance.

1. Change Orders authorizing use of funds from the contingency allowance will not include the Contractor's related costs and reasonable overhead and profit margins. Contractor shall include in base bid, Contractor's overhead, profit, insurance, bond and other direct cost.

2. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order or transfer the remaining amounts to other allowances as directed by the Architect.
3. The Contractor’s related costs for products or equipment ordered by the Owner under the contingency allowance, including delivery, installation, taxes, insurance, equipment rental, and similar costs are not part of the Contract Sum.

1.6 UNUSED MATERIALS

A. Return unused materials to the manufacturer or supplier for credit to the Owner, after installation has been completed and accepted.

B. Where it is not economically feasible to return unused material for credit and when requested by the Architect, prepare unused material for the Owner’s storage, and deliver to the Owner’s storage space as directed. Otherwise, disposal of excess material is the Contractor’s responsibility.

1.7 INSPECTION AND TESTING ALLOWANCES

A. Inspection and testing allowances include the cost of engaging the inspection or testing agencies and costs for reporting the results as well as costs for the actual inspections and tests.

B. The allowance does not include incidental labor required to assist the testing agency, or costs for retesting upon failure of previous tests and inspections. The allowance also does not include costs of services not required by the Contract Documents.

1. At Project closeout, credit unused amounts remaining in the inspection and testing allowance to Owner by Change Order.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect products covered by an allowance promptly upon delivery for damage or defects.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related construction activities.

3.3 SCHEDULE OF ALLOWANCES

A. **Allowance No. 1 – Owner’s Contingency:** Include a contingency allowance of $300,000.00 for use upon the Owner’s instructions.

B. **Allowance No. 2 – Signage and Graphics:** Include the lump sum of $15,000.00 for the provision and installation of interior signs as directed by the Architect.

C. **Allowance No. 3 – Landscape:** Include the lump sum of $75,000.00 for landscaping related items, to include removal of existing trees, replacement of trees that are removed, restoration of existing landscape areas disturbed during construction; Tree replacement, shall be in accordance with the City of San Antonio Landscape Ordinance with regards to the removal of existing trees.

END OF SECTION 012100
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling requests for substitutions made both prior to receipt of proposals and after as herein specified.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section "Submittals."

C. Standards: Refer to Section "Reference Standards and Definitions" for applicability of industry standards to products specified.

D. Procedural requirements governing the Contractor's selection of products and product options are included under Section "Materials and Equipment."

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor 10 days prior to receipt of proposals are considered requests for substitutions. The following are not considered substitutions:

1. Substitutions requested by Offerors during the proposing period, and accepted prior to award of Contract, are considered as included in the Contract Documents.

2. Revisions to Contract Documents requested by the Owner or Architect.


4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

A. Substitution Request Submittal: Requests for substitution will be considered if received at least 10 days prior to proposal date. Requests received after commencement of the Work may be considered or rejected at the discretion of the Architect. Requests for substitutions, made both prior to and after receipt of Proposals, are considered requests for substitutions. The following are not considered substitutions:

1. Substitutions requested by Offerors during the proposing period, and accepted prior to award of Contract, are considered as included in the Contract Documents.

2. Revisions to Contract Documents requested by the Owner or Architect.


4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1. Submit 3 copies of each request for substitution for consideration on CSI Form 1.5C. Submit requests in the form and in accordance with procedures required for Change Order proposals.

2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

   a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.

   b. Samples, where applicable or requested.

   c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.

   d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors that will become necessary to accommodate the proposed substitution.
e. A statement indicating the substitution's effect on the Anticipated Project Schedule and Contract Construction Schedule after award of contract compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.

f. Cost information, including a proposal of the net change, if any, from the specified product or assembly, or the contract sum.

g. Certification by the Offeror or Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

B. Architect's Action: If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance of the proposed substitution will be in the form of an Addendum which lists all prior approved products prior to award of contract and a change order after the award of contract.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Conditions: The Offeror's or Contractor's substitution request will be received and considered by the Architect when all of the mandatory conditions are satisfied and one or more of the optional conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.

1. Mandatory Conditions:

a. Submitted as required prior to proposing.

b. Extensive revisions to Contract Documents are not required.

c. Proposed changes are in keeping with the general intent of Contract Documents.

d. The request is timely, fully documented and properly submitted.

2. Optional Conditions:

a. The request is directly related to an "or equal" clause or similar language in the Contract Documents.

b. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

c. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

d. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

e. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Offeror or Contractor certifies that the substitution will overcome the incompatibility.

f. The specified product or method of construction cannot be coordinated with other materials, and where the Offeror or Contractor certifies that the substitution can be coordinated.

g. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Offeror or Contractor certifies that the proposed substitution provide the required warranty.

h. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

2.2 FAILURE OF TIMELY ORDER

A. The contractor is responsible for assuring the timely order of all materials specified. If a specified material or color of material cannot be delivered by the contract completion date, due to failure to order the material in a timely manner, the contractor shall be responsible for supplying an equal or better material. The architect shall be the sole determinant of the approved substitute material. The contractor shall also be charged an amount equal to 5% of the value of the specified material. This amount shall be credited to the owner through a change order to the
contract. The word "material", as used in this section, includes all items specified in the specifications or shown on the drawings.

PART 3 - EXECUTION  (Not Applicable)

END OF SECTION 012513
PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Submittals" for requirements for the Contractor's Construction Schedule.
   2. Division 1 Section "Application for Payment" for administrative procedures governing applications for payment.
   3. Division 1 Section "Product Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.
C. Allowances: Refer to Division 1 Section "Allowances" for description of Work in this Section affected by allowances.
D. Unit Prices: Refer to Division 1 Section "Unit Prices" for description of Work in this Section affected by unit prices.

1.3 MINOR CHANGES IN THE WORK
A. Instructions authorizing minor changes in the Work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Architect as part of a request for information on a Request for Interpretation Form as included in the Division-1 Section "Submittals".
B. Supplemental instructions authorizing minor changes in the Work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Architect on AIA form G710, Architect's Supplemental Instructions.

1.4 CHANGE ORDER PROPOSAL REQUESTS
A. Owner-Initiated Proposal Requests: Proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time will be issued by the Architect, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.
   1. Proposal requests issued by the Architect are for information only. Do not consider them an instruction either to stop work in progress, or to execute the proposed change.
   2. Unless otherwise indicated in the proposal request, within 20 days of receipt of the proposal request, submit to the Architect for the Owner's review an estimate of cost necessary to execute the proposed change.
   3. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Furnish survey data to substantiate quantities and costs on Providers' letterheads, including, but not limited to, Subcontractors' letterheads.
   4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   5. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
B. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.
   1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
   2. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Furnish survey data to substantiate quantities and costs on Providers' letterheads, including, but not limited to, Subcontractors' letterheads.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Comply with requirements in Section "Product Substitutions" if the proposed change in the Work requires the substitution of one product or system for a product or system specified.

1.5 ALLOWANCES

A. Allowance Adjustment: Base each Change Order Proposal Request for an allowance cost adjustment solely on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place, with reasonable allowances, where applicable, for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in the purchase amount only where indicated as part of the allowance.
2. When requested, prepare explanations and documentation to substantiate the margins claimed.
3. Submit substantiation of a change in scope of work claimed in the Change Orders related to unit-cost allowances.
4. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G714, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 CHANGE ORDER PROCEDURES

A. Upon the Owner’s approval of a Change Order Proposal Request, the Architect will issue a Change Order for signatures of the Owner and Contractor on AIA Form G701, as provided in the Conditions of the Contract.

PART 2 - PRODUCTS  (Not Applicable)

PART 3 - EXECUTION  (Not Applicable)

END OF SECTION 012600
SECTION 013100 - PROJECT COORDINATION

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section specifies administrative and supervisory requirements necessary for Project coordination including,
      but not necessarily limited to:
      1. Coordination.
      2. Administrative and supervisory personnel.
      4. Cleaning and protection.
   B. Field engineering is included in Division 1 Section "Field Engineering".
   C. Progress meetings: coordination meetings and pre-installation conferences are included in Division 1 Section
      "Project Meetings".
   D. Requirements for the Contractor's Construction Schedule are included in Division 1 Section "Submittals".

1.3 COORDINATION
   A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure
      efficient and orderly installation of each part of the Work. Coordinate construction operations included under
      different Sections of the Specifications that are dependent upon each other for proper installation, connection, and
      operation.
      1. Where installation of one part of the Work is dependent on installation of other components, either before or
         after its own installation, schedule construction activities in the sequence required to obtain the best results.
      2. Where availability of space is limited, coordinate installation of different components to assure maximum
         accessibility for required maintenance, service and repair.
      3. Make adequate provisions to accommodate items scheduled for later installation.
         a. Where necessary, prepare memoranda for distribution to each party involved outlining special
            procedures required for coordination. Include such items as required notices, reports, and attendance at
            meetings.
      4. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is
         required.
   B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other
      construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities
      include, but are not limited to, the following:
      1. Preparation of schedules.
      2. Installation and removal of temporary facilities.
      3. Delivery and processing of submittals.
      4. Progress meetings.
      5. Project Close-out activities.
   C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given
      to conservation of energy, water, and materials.
      1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.
      Refer to other sections for disposition of salvaged materials that are designated as Owner's property.
1.4 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Division 1 Section "Submittals."
4. Refer to Division 22 Section "Plumbing", Division 23 Section "Heating, Venting, And Air-Conditioning (HVAC)", and Division 26 Section "Electrical" for specific coordination Drawing requirements for mechanical and electrical installations.

B. Staff Names: Within 15 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.


F. Recheck measurements and dimensions, before starting each installation.

G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
19. Electrical current.
20. High speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 013100
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-Construction Conference.
2. Pre-Installation Conferences.
3. Coordination Meetings.
4. Progress Meetings.

B. Construction schedules are specified in another Division 1 Section.

1.3 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: The Owner, Architect and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule.
2. Critical Work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
7. Submittal of Shop Drawings, Product Data and Samples.
8. Preparation of record documents.
9. Use of the premises.
10. Office, Work and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.
15. Housekeeping.
16. Working hours.
17. Work that will interfere with Owner's operations at the construction site or at adjacent Owner sites, including but not limited to planned power interruptions and unplanned, unforeseen/nonemergency power interruptions that become necessary as the Work progresses.

1.4 PRE-INSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect of scheduled meeting dates.

B. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
2. Options.
3. Related Change Orders.
4. Purchases.
5. Deliveries.
6. Shop Drawings, Product Data and quality control Samples.
7. Possible conflicts.
9. Time schedules.
10. Weather limitations.
11. Manufacturer's recommendations.
14. Temporary facilities.
15. Space and access limitations.
17. Safety.
18. Inspection and testing requirements.
20. Recording requirements.

C. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Architect.

D. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 COORDINATION MEETINGS

A. Conduct Project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 PROGRESS MEETINGS

A. Conduct progress meetings at the Project sites once a month. Notify the Owner and Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

D. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1. Review the present and future needs of each entity present, including such items as:
   a. Interface requirements.
   b. Time.
c. Sequences.
d. Deliveries.
e. Off-site fabrication problems.
f. Access.
g. Site utilization.
h. Temporary facilities and services.
i. Hours of Work.
j. Hazards and risks.
k. Housekeeping.
l. Quality and Work standards.
m. Change Orders.
n. Documentation of information for payment requests.

E. Reporting: No later than 3 days after each progress meeting date, the contractor shall distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – SCHEDULE OF REQUIRED PRE-INSTALLATION MEETINGS

Division 2 – Site Work
________ Irrigation
________ Landscaping

Division 3 – Concrete
________ Concrete (place – finish)

Division 4 – Masonry
________ *Unit Masonry Assemblies/block/brick/stone: Note: this pre-installation meeting to be combined with damp proofing and Storefront, Windows and Glazing. Mockup must have been approved prior to meeting.

Division 5 – Metals and Division
________ Structural Steel: General Contractor (GC), Architect, LISD, Structural Engineer, Erector Sub Contractor, and Material Testing Lab shall attend this meeting.
________ Cold Formed Metal Framing

Division 6 - Carpentry
________ Finish Carpentry and Millwork – Mockup must have been approved prior to meeting.

Division 7 – Thermal and Moisture Protection
________ *Damp proofing: Note: this pre-installation meeting to be combined with damp proofing and Storefront, Windows and Glazing.
________ Waterproofing
________ *Roofing – (Metal, Metal Soffit, Torch Applied Modified Bitumen Roof System, etc): GC, Roofing subcontractor, Mechanical Electrical and Plumbing subcontractor, Roofing Materials supplier, Architect, Roofing consultants, and LISD
________ Exterior Sheathing

Division 8 – Doors and Windows
________ *Storefront, Windows and Glazing: Note: this pre-installation meeting to be combined with damp proofing and Storefront, Windows and Glazing.
________ Door Hardware

Division 9 – Finishes
________ Gypsum Board Assemblies (Includes all stud and ceiling framing)
________ Gypsum Shaft Wall Assemblies
________ Tile – Quarry, Ceramic, and VCT:
Painting
Polished Concrete Floors

Division 15/16 – Mechanical & Division 16 - Electrical
HVAC/Plumbing/Electrical/Fire Sprinkler
Controls – Controls and HVAC sub at this meeting.

Division 17 – Telecommunication
Telecomm and Cabling

END OF SECTION 013119
SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

1. Contractor's construction schedule.
2. Submittal schedule.
3. Daily construction reports.
4. Shop Drawings.
5. Product Data.
6. Samples.
7. Request for Interpretation

B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits.
2. Applications for payment.
3. Performance and payment bonds.
4. Insurance certificates.
5. List of Subcontractors.

C. The Schedule of Values submittal is included in Section "Applications for Payment."

D. Inspection and test reports are included in Section "Quality Control Services."

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's and Program Manager's responsive action. Submittals may be rejected for not complying with requirements.

B. Informational Submittals: Written information that does not require Architect's and Program Manager's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings, the Building Information Model (BIM), and the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.


1. Submit electronic submittals to the Architect and Project Design Consultants in the method indicated by the Architect.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.

4. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Architect will promptly advise the Contractor when a submittal being processed must be delayed for coordination.

a. If an intermediate submittal is necessary, process the same as the initial submittal.

5. Allow two weeks for reprocessing each submittal.

a. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

D. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4 inches x 5 inches on the label or beside the title block on Shop Drawings to record the Contractor’s review and approval markings and the action taken.

2. Include the following information on the label for processing and recording action taken.

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Number and title of appropriate Specification Section.

1.) Drawing number and detail references, as appropriate.

E. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

1. Record on the transmittal Record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor’s certification that information complies with Contract Document requirements.

1.5 CONTRACTOR’S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor’s construction schedule. Submit within 30 days of the date established for “Commencement of the Work”.

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the “Schedule of Values.”

2. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.

3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.

4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.

5. Coordinate the Contractor’s construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.

6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect’s procedures necessary for certification of Substantial Completion.

B. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.
C. Cost Correlation: At the head of the schedule, provide a two item cost correlation line, indicating "precalculated" and "actual" costs. On the line show dollar-volume of Work performed as of the dates used for preparation of payment requests.

1. Refer to Section "Applications for Payment" for cost reporting and payment procedures.

D. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

E. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.6 SUBMITTAL SCHEDULE

A. After development and acceptance of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for establishment of the Contractor's construction schedule.

1. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.

2. Prepare the schedule in chronological order; include submittals required during the first 90 days of construction. Provide the following information:

   a. Scheduled date for the first submittal.
   b. Related Section number.
   c. Submittal category.
   d. Name of subcontractor.
   e. Description of the part of the Work covered.
   f. Scheduled date for resubmittal.

   1.) Scheduled date the Architect's final release or approval.

B. Distribution: Following response to initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.7 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect and Owner at weekly intervals:

1. List of subcontractors at the site.
2. Approximate count of personnel at the site.
3. High and low temperatures, general weather conditions.
4. Accidents and unusual events.
5. Meetings and significant decisions.
7. Meter readings and similar recordings.
8. Emergency procedures.
9. Orders and requests of governing authorities.
10. Change Orders received, implemented.
11. Services connected, disconnected.
12. Equipment or system tests and start-ups.
13. Partial Completions, occupancies.

1.8 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
   1. Dimensions.
   2. Identification of products and materials included.
   3. Compliance with specified standards.
   4. Notation of coordination requirements.
   5. Notation of dimensions established by field measurement.

C. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 inch x 11 inch but no larger than 36 inch x 48 inch.

D. Initial and intermediate submittals: Submit one correctable translucent reproducible print and one blue- or black-line print for the Architect's review; the reproducible print will be returned.

E. Final Submittal: Submit one correctable translucent reproducible print and two blue-line or black-line prints for the Architect's review; the reproducible print and one blue-line or black-line will be returned. The Contractor shall provide necessary final copies to be included in maintenance manuals.
   1. One copy maintained as a "Record Document".

F. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

G. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.
   1. Preparation of coordination Drawings is specified in Division 1 Section "Project Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.
   2. Submit coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

1.9 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

   1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
      a. Manufacturer's printed recommendations.
      b. Compliance with recognized trade association standards.
      c. Compliance with recognized testing agency standards.
      d. Application of testing agency labels and seals.
      e. Notation of dimensions verified by field measurement.
   1.) Notation of coordination requirements.

   f. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
B. Preliminary Submittal: Submit a preliminary single-copy of Product Data where selection of options is required.

C. Submittals: Submit 2 copies of each required submittal; submit 4 copies where required for maintenance manuals. The Architect will retain one, and will return the other marked with action taken and corrections or modifications required.

   1. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

D. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

   1. Do not proceed with installation until an applicable copy of Product Data applicable is in the installer's possession.

   2. Do not permit use of unmarked copies of Product Data in connection with construction.

1.10 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

   1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's Sample. Include the following:

      a. Generic description of the Sample.
      b. Sample source.
      c. Product name or name of manufacturer.
      d. Compliance with recognized standards.

      1.) Availability and delivery time.

   2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

      a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
      b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
      c. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.

B. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.

   1. Preliminary submittals will be reviewed and returned with the Architect's mark indicating selection and other action.

C. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.

   1. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.

   2. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

      a. Sample sets may be used to obtain final acceptance of the construction associated with each set.

D. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
1. Field Samples specified in individual Sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.

   a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.11 ARCHITECT'S ACTION

   A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each architectural submittal, mark to indicate action taken, and return promptly.

      1. Compliance with specified characteristics is the Contractor's responsibility.

      B. Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

         1. Final Release: Where submittals are marked “No Exceptions,” that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

         2. Final-But-Restricted Release: When submittals are marked “Exceptions Noted” or “Make Corrections Noted”, that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

         3. Returned for Resubmittal: When submittal is marked “Revise and Resubmit,” do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

            a. Do not permit submittals marked “Revise and Resubmit” to be used at the Project site, or elsewhere where Work is in progress.

         4. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked “No Exceptions”.

1.12 REQUEST FOR INTERPRETATION

   A. All contractor request for interpretation pertaining to all aspects of the construction documents and this project shall be submitted on the form at the end of this section, or on the Construction Specification Institute form, CSI Form 13.2A, “Request For Interpretation”. The Architect shall review the Contractor’s “Request For Interpretation” form for acceptance, if requested for use.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).
REQUEST FOR INTERPRETATION
(R.F.I.)

PROJECT:

CONTRACTOR:

ARCHITECT: SHW Group LLP

THIS IS A FIELD AND/OR OFFICE REQUEST FOR INTERPRETATION TO SUPPLEMENT THE DESIGN DATA
DEPICTED ON THE DRAWINGS OR IN THE SPECIFICATIONS. CHANGES TO THE CONTRACT DOCUMENTS, THE
CONTRACT SUM, OR THE TIME FOR CONTRACT PERFORMANCE THAT MAY RESULT FROM THE REPLY TO THIS
RFI SHALL BE PROCESSED IN ACCORDANCE WITH THE CHANGES CLAUSE OF THE CONTRACT, IF
APPROPRIATE.

QUESTION:

Submitted by: ____________________________________________

Drawing/Specification: _______________________________________

PROPOSED OR SUGGESTED SOLUTION:

Copies to:

________________________
________________________
________________________
________________________

Date: _______________________

R.F.I. No.: ___________________

END OF SECTION 013300
SECTION 014219 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. 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.

C. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Architect, requested by the Architect, and similar phrases.

D. Approved: The term approved, when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations: The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. Install: The term install describes operations at the Project site including the actual unloading, unpacking, assembly, erection, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. Provide: The term provide means furnish and install, complete and ready for the intended use.

I. Installer: An Installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term experienced, when used with the term Installer, means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

2. Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no choice or option. However, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

J. Project site is the space available to the Contractor for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
K. Testing Agencies: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's MASTERFORMAT numbering system.

1. Text Subordination: Portions of the Specification may be subordinated to other portions in the following manner:

   a. Certain Sections may be subordinate to other Sections or parts of other Sections. When that occurs, the degree of subordination is described in those Sections.
   b. Paragraphs and lines of text are subordinate to article titles.
   c. Paragraphs and lines of text that are indented from the left hand margin are subordinate to the preceding text that is either not indented or indented by a lesser amount.

2. Underscoring, Bold Letters and Bold Numbers are used strictly to assist the reader in scanning for key words. No emphasis or relative importance is intended for text where underscoring, bold letters and bold numbers are used.

B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated, as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

   a. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different but apparently equal and other uncertainties to the Architect for a decision before proceeding.

   1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

   1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.
   2. The Architect reserves the right to require the Contractor to submit copies of standards as necessary for enforcement of requirements.
### Abbreviations and Names

Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but not ensured, to be accurate and up to date as of the date of Contract Documents. If an abbreviation, or name, is not on the following list, refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name</th>
<th>Website</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Aluminum Association</td>
<td><a href="http://www.aluminum.org">www.aluminum.org</a></td>
<td>900 19th St., NW, Suite 300</td>
<td>(202) 862-5100</td>
</tr>
<tr>
<td>AABC</td>
<td>Associated Air Balance Council</td>
<td><a href="http://www.aabchq.com">www.aabchq.com</a></td>
<td>1518 K St., NW</td>
<td>(202) 737-0202</td>
</tr>
<tr>
<td>AAMA</td>
<td>American Architectural Manufacturers Assoc.</td>
<td><a href="http://www.aamanet.org">www.aamanet.org</a></td>
<td>1540 E. Dundee Road, Suite 310</td>
<td>(847) 303-5664</td>
</tr>
<tr>
<td>AAN</td>
<td>American Association of Nurserymen</td>
<td>(see ANLA)</td>
<td>1250 I St., NW, Suite 500</td>
<td>(202) 789-2900</td>
</tr>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
<td><a href="http://www.aashto.org">www.aashto.org</a></td>
<td>444 North Capitol St., Suite 249</td>
<td>(202) 624-5800</td>
</tr>
<tr>
<td>AATCC</td>
<td>American Association of Textile Chemists and Colorists</td>
<td><a href="http://www.aatcc.org">www.aatcc.org</a></td>
<td>P.O. Box 12215</td>
<td>(919) 549-8141</td>
</tr>
<tr>
<td>ABMA</td>
<td>American Bearing Manufacturers Assoc.</td>
<td><a href="http://www.abma-dc.org">www.abma-dc.org</a></td>
<td>1200 19th St., Suite 300</td>
<td>(202) 367-1155</td>
</tr>
<tr>
<td>ABMA</td>
<td>American Boiler Manufacturers Association</td>
<td><a href="http://www.abma.com">www.abma.com</a></td>
<td>950 North Glebe Rd., Suite 160</td>
<td>(703) 522-7350</td>
</tr>
<tr>
<td>ACI</td>
<td>American Concrete Institute</td>
<td><a href="http://www.aci-int.org">www.aci-int.org</a></td>
<td>P.O. Box 19150</td>
<td>(248) 848-3700</td>
</tr>
<tr>
<td>ACIL</td>
<td>American Council of Independent Laboratories</td>
<td><a href="http://www.acil.org">www.acil.org</a></td>
<td>1629 K St., NW</td>
<td>(202) 887-5872</td>
</tr>
<tr>
<td>ACPA</td>
<td>American Concrete Pipe Association</td>
<td><a href="http://www.concrete-pipe.org">www.concrete-pipe.org</a></td>
<td>8618 Westwood Center Dr., Suite 105</td>
<td>(972) 506-7216</td>
</tr>
<tr>
<td>ADC</td>
<td>Air Diffusion Council</td>
<td><a href="http://www.flexibleduct.org">www.flexibleduct.org</a></td>
<td>11 South LaSalle St., Suite 1400</td>
<td>(312) 201-0101</td>
</tr>
<tr>
<td>AFBMA</td>
<td>Anti-Friction Bearing Manufacturers Assoc. (Now ABMA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AFPA</td>
<td>American Forest and Paper Association</td>
<td>(See AF&amp;PA)</td>
<td>1111 19th St., NW, Suite 800</td>
<td>(202) 463-2700</td>
</tr>
</tbody>
</table>
AF&PA  American Forest & Paper Association  www.afandpa.org

AGA  American Gas Assoc.
     1515 Wilson Blvd.
     Arlington, VA 22209
     (202) 824-7000

AGC  Associated General Contractors of America  www.agc.org
     (703) 548-3118

AHA  American Hardboard Assoc.
     1210 W. Northwest Highway
     Palatine, IL 60067
     (847) 934-8800

AHAM  Association of Home Appliance Manufacturers
     20 N. Wacker Dr., Suite 1500
     Chicago, IL 60606
     (202) 872-5955

AI  Asphalt Institute
     Research Park Dr.
     P.O. Box 14052
     Lexington, KY 40512-4052
     (859) 288-4960

AIA  The American Institute of Architects
     1735 New York Ave., NW
     Washington, DC 20006
     (202) 626-7300

AIA  American Insurance Assoc.
     1130 Connecticut Ave., NW, Suite 1000
     Washington, DC 20036
     (202) 828-7100

AIHA  American Industrial Hygiene Assoc.
     2700Prospect Ave., Suite 250
     Fairfax, VA 22031
     (703) 849-8888

AISC  American Institute of Steel Construction
     One East Wacker Dr., Suite 3100
     Chicago, IL 60601-2001
     (800) 644-2400
     (312) 670-2400

AISI  American Iron and Steel Institute
     1101 17th St., NW
     Washington, DC 20036-4700
     (202) 452-7100

AITC  American Institute of Timber Construction
     7012 S. Revere Pkwy, Suite 140
     Englewood, CO 80112
     (303) 792-9559

ALA  American Laminators Association
     419 Norton Building
     Seattle, WA 98104-1584
     (See LMA)
     (206) 622-0666

ALI  Associated Laboratories, Inc.
     c/o HOH Chemicals
     500 S. Vermont St.
     Palatine, IL 60067
     (800) 685-0026

ALSC  American Lumber Standards Committee
     P.O. Box 210
     Germantown, MD 20875
     (301) 972-1700

AMCA  Air Movement and Control Assoc.
     30 W. University Dr.
     Arlington Heights, IL 60004-1893
     (847) 394-0150

ANLA  American Nursery & Landscape Association  www.amac.org
<table>
<thead>
<tr>
<th>Organization</th>
<th>Address</th>
<th>Phone Numbers</th>
<th>Website Link</th>
</tr>
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<tbody>
<tr>
<td>ASPE</td>
<td>American Society of Plumbing Engineers</td>
<td><a href="http://www.aspe.org">www.aspe.org</a></td>
<td>(Now TPI)</td>
</tr>
<tr>
<td></td>
<td>8614 Catalpa Avenue, Suite 1007</td>
<td>(773) 693-2773</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chicago, IL 60656-1116</td>
<td></td>
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</tr>
<tr>
<td>ASSE</td>
<td>American Society of Sanitary Engineering</td>
<td><a href="http://www.asse-plumbing.org">www.asse-plumbing.org</a></td>
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</tr>
<tr>
<td></td>
<td>P.O. Box 40362</td>
<td>(440) 835-3040</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bay Village, OH 44140</td>
<td></td>
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<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
<td><a href="http://www.astm.org">www.astm.org</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 Barr Harbor Dr.</td>
<td>(610) 832-9585</td>
<td></td>
</tr>
<tr>
<td></td>
<td>West Conshohocken, PA 19428</td>
<td></td>
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</tr>
<tr>
<td>ATIS</td>
<td>Alliance for Telecommunications Industry Solutions</td>
<td><a href="http://www.atis.org">www.atis.org</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1200 G St., NW, Suite 500</td>
<td>(202) 628-6380</td>
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<tr>
<td></td>
<td>Washington, DC 20005</td>
<td></td>
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<tr>
<td>AWCMA</td>
<td>American Window Covering Manufacturers Assoc.</td>
<td>(Now WCMA)</td>
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<tr>
<td>AWI</td>
<td>Architectural Woodwork Institute</td>
<td><a href="http://www.awinet.org">www.awinet.org</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>46179 Westlake Drive, Suite 120</td>
<td>(571) 323-3636</td>
<td></td>
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<tr>
<td></td>
<td>Potomac Falls, VA 20165</td>
<td></td>
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<tr>
<td>AWPA</td>
<td>American Wood Preservers' Assoc.</td>
<td><a href="http://www.awpa.com">www.awpa.com</a></td>
<td></td>
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<tr>
<td></td>
<td>P.O. Box 286</td>
<td>(817) 326-6300</td>
<td></td>
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<tr>
<td></td>
<td>Woodstock, MD 21163-0286</td>
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<tr>
<td>AWPB</td>
<td>American Wood Preservers' Bureau</td>
<td>(This organization is now defunct.)</td>
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<tr>
<td>AWS</td>
<td>American Welding Society</td>
<td><a href="http://www.aws.org">www.aws.org</a></td>
<td></td>
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<tr>
<td></td>
<td>550 LeJeune Rd., NW</td>
<td>(800) 443-9353</td>
<td></td>
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<tr>
<td></td>
<td>Miami, FL 33126</td>
<td>(305) 443-9353</td>
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<tr>
<td>AWWA</td>
<td>American Water Works Assoc.</td>
<td><a href="http://www.awwa.org">www.awwa.org</a></td>
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<tr>
<td></td>
<td>6666 W. Quincy Ave.</td>
<td>(800) 926-7337</td>
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<tr>
<td></td>
<td>Denver, CO 80235</td>
<td>(303) 794-7711</td>
<td></td>
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<tr>
<td>BANC</td>
<td>Brick Association of North Carolina</td>
<td></td>
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<tr>
<td></td>
<td>P.O. Box 13290</td>
<td>(910) 273-5566</td>
<td></td>
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<tr>
<td></td>
<td>Greensboro, NC 27415-3290</td>
<td></td>
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<tr>
<td>BHMA</td>
<td>Builders Hardware Manufacturers Assoc.</td>
<td><a href="http://www.buildershardware.com">www.buildershardware.com</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>355 Lexington Ave., 17th Floor</td>
<td>(212) 297-2122</td>
<td></td>
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<tr>
<td></td>
<td>New York, NY 10017-6603</td>
<td></td>
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<tr>
<td>BIA</td>
<td>Brick Institute of America</td>
<td><a href="http://www.bia.org">www.bia.org</a></td>
<td></td>
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<tr>
<td></td>
<td>11490 Commerce Park Dr.</td>
<td>(703) 620-0010</td>
<td></td>
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<tr>
<td></td>
<td>Reston, VA 22091-1525</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIFMA</td>
<td>The Business and Institutional Furniture Manufacturer's Association</td>
<td><a href="http://www.bifma.com">www.bifma.com</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>International</td>
<td>(616) 285-3963</td>
<td></td>
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<tr>
<td></td>
<td>2680 Horizon Dr., SE, Suite A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grand Rapids, MI 49546-7500</td>
<td></td>
<td></td>
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<tr>
<td>CAGI</td>
<td>Compressed Air and Gas Institute</td>
<td><a href="http://www.cagi.org">www.cagi.org</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c/o Thomas Associates, Inc.</td>
<td>(216) 241-7333</td>
<td></td>
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<tr>
<td></td>
<td>1300 Summer Ave.</td>
<td></td>
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<tr>
<td></td>
<td>Cleveland, OH 44115-2851</td>
<td></td>
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<tr>
<td>CAUS</td>
<td>Color Association of the United States</td>
<td><a href="http://www.colorassociation.com">www.colorassociation.com</a></td>
<td></td>
</tr>
</tbody>
</table>
CTI Cooling Technology Institute  
(Formerly: Cooling Tower Institute)  
www.cti.org  
(281) 583-4087

CTIOA Ceramic Tile Institute of America  
12061 West Jefferson Blvd.  
Culver City, CA 90230 – 6219  
www.ctia.org  
(310) 574-7800

DHI Door and Hardware Institute  
14170 Newbrook Dr.  
Chantilly, VA 22021-2223  
www.dhi.org  
(703) 222-2010

DIPRA Ductile Iron Pipe Research Assoc.  
245 Riverchase Parkway East, Suite O  
Birmingham, AL 35244  
www.dipra.com  
(205) 402-8700

DLPA Decorative Laminate Products Assoc.  
13924 Braddock Rd.  
Centreville, VA 22020  
(800) 684-3572

ECSA Exchange Carriers Standards Assoc.  
(Now ATIS)

EIA/TIA Electronic Industries Alliance/Telecommunications Industry  
2001 Pennsylvania Ave., NW  
Washington, DC 20006-1813  
www.eia.org  
(703) 907-7500

EIMA EIFS Industry Manufacturers Assoc.  
2759 State Road 580, Suite 112  
Clearwater, FL 34621  
www.eifsfacts.com  
(800) 294-3462  
(770) 968-7945

EJMA Expansion Joint Manufacturers Assoc.  
25 N. Broadway  
Tarrytown, NY 10591  
www.ejma.org  
(914) 332-0040

ETL ETL SEMKO Testing Laboratories, Inc.  
420 North Dorothy Drive  
Richardson, Texas 75081  
www.etlsemko.com  
(972) 238-5591

FCI Fluid Controls Institute  
c/o Thomas Associates, Inc.  
1300 Summer Ave.  
Cleveland, OH 44115-2851  
www.fluidcontrols institute.org  
(216) 241-7333

FCICA Floor Covering Installation Contractors Assoc.  
(Formerly Floor Covering Installation Board)  
P.O. Box 948  
Dalton, GA 30722-0948  
(706) 226-5488

FGMA Flat Glass Marketing Assoc.  
(Now GANA)

FM Factory Mutual  
1151 Boston-Providence Turnpike  
P.O. Box 9102  
Norwood, MA 02062  
www.fmglobal.com  
(617) 762-4300  
(401) 275-3000

FTI Facing Tile Institute  
P.O. Box 8880  
Canton, OH 44711  
(216) 488-1211

GA Gypsum Association  
810 First St., NE, Suite 510  
www.gypsum.org
<table>
<thead>
<tr>
<th>Reference Standards and Definitions</th>
<th>Website Address</th>
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<tbody>
<tr>
<td>NCPI National Clay Pipe Institute</td>
<td><a href="http://www.ncpi.org">www.ncpi.org</a></td>
</tr>
<tr>
<td>P.O. Box 759</td>
<td>(414) 248-9094</td>
</tr>
<tr>
<td>253-80 Center St.</td>
<td></td>
</tr>
<tr>
<td>Lake Geneva, WI 53147</td>
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<tr>
<td>NCRPM National Council on Radiation Protection and Measurements</td>
<td><a href="http://www.ncrp.com">www.ncrp.com</a></td>
</tr>
<tr>
<td>7910 Woodmont Ave., Suite 400</td>
<td>(301) 657-2652</td>
</tr>
<tr>
<td>Bethesda, MD 20814 - 3095</td>
<td></td>
</tr>
<tr>
<td>NCSPA National Corrugated Steel Pipe Association</td>
<td><a href="http://www.ncspa.org">www.ncspa.org</a></td>
</tr>
<tr>
<td>13140 Coit Road, Suite 320 LB120</td>
<td>(972) 850-1907</td>
</tr>
<tr>
<td>Dallas, Texas 75240</td>
<td></td>
</tr>
<tr>
<td>NCTA National Cable Television Association</td>
<td><a href="http://www.ncta.com">www.ncta.com</a></td>
</tr>
<tr>
<td>NCRPM National Council on Radiation Protection and Measurements</td>
<td><a href="http://www.ncrp.com">www.ncrp.com</a></td>
</tr>
<tr>
<td>7910 Woodmont Ave., Suite 400</td>
<td>(301) 657-2652</td>
</tr>
<tr>
<td>Bethesda, MD 20814 - 3095</td>
<td></td>
</tr>
<tr>
<td>NEBB National Environmental Balancing Bureau</td>
<td><a href="http://www.nebb.org">www.nebb.org</a></td>
</tr>
<tr>
<td>NECA National Electrical Contractors Assoc.</td>
<td><a href="http://www.necanet.org">www.necanet.org</a></td>
</tr>
<tr>
<td>3 Bethesda Metro Center, Suite 1100</td>
<td>(301) 657-3110</td>
</tr>
<tr>
<td>Bethesda, MD 20814-5372</td>
<td></td>
</tr>
<tr>
<td>NEII National Elevator Industry, Inc.</td>
<td><a href="http://www.neii.org">www.neii.org</a></td>
</tr>
<tr>
<td>1677 County Road 64</td>
<td>(518) 854-3100</td>
</tr>
<tr>
<td>P.O. Box 838</td>
<td></td>
</tr>
<tr>
<td>Salem, New York 12865 - 0838</td>
<td></td>
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<td>NELMA Northeastern Lumber Manufacturers Assoc.</td>
<td><a href="http://www.nelma.org">www.nelma.org</a></td>
</tr>
<tr>
<td>272 Tuttle Rd.</td>
<td>(207) 829-6901</td>
</tr>
<tr>
<td>P.O. Box 87A</td>
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</tr>
<tr>
<td>Cumberland Center, ME 04021</td>
<td></td>
</tr>
<tr>
<td>NEMA National Electrical Manufacturers Assoc.</td>
<td><a href="http://www.nema.org">www.nema.org</a></td>
</tr>
<tr>
<td>2101 L St., NW, Suite 300</td>
<td>(703) 841-3200</td>
</tr>
<tr>
<td>Washington, DC 20037</td>
<td></td>
</tr>
<tr>
<td>NETA International Electrical Testing Assoc.</td>
<td><a href="http://www.netaworld.org">www.netaworld.org</a></td>
</tr>
<tr>
<td>P.O. Box 687</td>
<td>(303) 697-8441</td>
</tr>
<tr>
<td>Morrison, CO 80465-1526</td>
<td></td>
</tr>
<tr>
<td>NFPA National Fire Protection Assoc.</td>
<td><a href="http://www.nfpa.org">www.nfpa.org</a></td>
</tr>
<tr>
<td>One Batterymarch Park</td>
<td>(617) 770-3000</td>
</tr>
<tr>
<td>P.O. Box 9101</td>
<td>(800) 344-3555</td>
</tr>
<tr>
<td>Quincy, MA 02269-9101</td>
<td></td>
</tr>
<tr>
<td>NFPA National Forest Products Assoc. (Now AF&amp;PA)</td>
<td><a href="http://www.nfrc.org">www.nfrc.org</a></td>
</tr>
<tr>
<td>NFRC National Fenestration Rating Council</td>
<td>(301) 589-6372</td>
</tr>
<tr>
<td>NGA National Glass Association</td>
<td><a href="http://www.glass.org">www.glass.org</a></td>
</tr>
<tr>
<td>(703) 442-4890</td>
<td></td>
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<tr>
<td>NHLA National Hardwood Lumber Assoc.</td>
<td><a href="http://www.nathardwood.org">www.nathardwood.org</a></td>
</tr>
<tr>
<td>P.O. Box 34518</td>
<td>(800) 933-0318</td>
</tr>
<tr>
<td>Memphis, TN 38184-0518</td>
<td>(901) 377-1818</td>
</tr>
<tr>
<td>NKCA National Kitchen Cabinet Assoc. (Now KCMA)</td>
<td><a href="http://www.nkca.org">www.nkca.org</a></td>
</tr>
<tr>
<td>Reference Standards and Definitions</td>
<td>©2014 SHW Group</td>
</tr>
</tbody>
</table>
NLGA  National Lumber Grades Authority
103-4400 Dominion St.
Burnaby, BC V5G 4G3
CANADA
www.nlga.org
(604) 524-2393

NOFMA  National Oak Flooring Manufacturers Assoc.
P.O. Box 3009
Memphis, TN 38173-0009
www.nofma.org
(901) 526-5016

NPA  National Particleboard Assoc.
18928 Premiere Ct.
Gaithersburg, MD 20879-1569
(See CPA)
(301) 670-0604

NPCA  National Paint and Coatings Assoc.
1500 Rhode Island Ave., NW
Washington, DC 20005
www.paint.org
(202) 462-6272

NRCA  National Roofing Contractors Assoc.
O’Hare International Center
10255 W. Higgins Rd., Suite 600
Rosemont, IL 60018-5607
www.nrca.net
(800) 323-9545
(847) 299-9070

NRMCA  National Ready Mixed Concrete Association
www.nrmca.org
(888) 846-7622

NSA  National Stone Association
www.aggregates.org
(800) 342-1415

NSF  NSF International
(Formerly National Sanitation Foundation)
3475 Plymouth Rd.
P.O. Box 130140
Ann Arbor, MI 48113-0140
www.nsf.org
(800) 673-6275
(734) 769-8010

NSSEA  National School Supply and Equipment Assoc.
8300 Colesville Rd., Ste. 250
Silver Spring, MD 20910
www.nssea.org
(301) 495-0240

NTMA  National Terrazzo and Mosaic Assoc.
3166 Des Plaines Ave., Suite 132
Des Plaines, IL 60018
www.ntma.com
(800) 323-9736
(703) 779-1022

NWMA  National Woodwork Manufacturers Assoc.
(Now NWWDA)
www.nrmca.org

NWWDA  National Wood Window and Door Assoc.
1400 E. Touhy Ave., #G54
Des Plaines, IL 60018
(See WCMA)
(708) 299-5200
(800) 223-2301

PATMI  Power Actuated Tool Manufacturers’ Institute, Inc.
1603 Boone’s Lick Road
St. Charles, MO 63301
www.patmi.org
(636) 947-6610

PCA  Portland Cement Assoc.
5420 Old Orchard Rd.
Skokie, IL 60077-1083
www.portcement.org
(847) 966-6200

PCI  Precast/Prestressed Concrete Institute
175 W. Jackson Blvd.
Chicago, IL 60604
www pci.org
(312) 786-0300

PDCA  Painting and Decorating Contractors of America
www.pdca.com
(800) 332-7322
Federal Government Agencies:

Names and titles of Federal Government standards- or specification-producing agencies are often abbreviated. The following abbreviations and acronyms referenced in the Contract Documents indicate names of standards- or specification-producing agencies of the Federal Government. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

- CE Corps of Engineers (U.S. Department of the Army)  
  Chief of Engineers  
  General Information Referral  
  20 Massachusetts Ave., NW  
  Washington, DC 20314  
  (202) 761-0660  
  [Website: www.usace.army.mil]

- CFR Code of Federal Regulations  
  (Available from the Government Printing Office)  
  732 N. Capitol St., NW  
  Washington, DC 20401  
  (202) 512-0000  
  [Website: www.gpoaccess.gov]

- CPSC Consumer Product Safety Commission  
  East West Towers  
  4330 East-West Hwy  
  Bethesda, MD 20814  
  (800) 638-2772  
  [Website: www.cpsc.gov]

- CS Commercial Standard (U.S. Department of Commerce)  
  Government Printing Office  
  Washington, DC 20402  
  (202) 512-0000  
  [Website: www.commerce.gov]

- DOC Department of Commerce  
  14th St. and Constitution Ave., NW  
  Washington, DC 20230  
  (202) 482-2000  
  [Website: www.doc.gov]

- DOT Department of Transportation  
  400 Seventh St., SW  
  Washington, DC 20590  
  (202) 366-4000  
  [Website: www.dot.gov]

- EPA Environmental Protection Agency  
  [Website: www.epa.gov]
G. GOVERNING REGULATIONS/AUTHORITIES

1. The Architect has contacted authorities having jurisdiction where necessary to obtain information necessary for preparation of Contract Documents. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

1.5 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 014219
SECTION 014500 - QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.

2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

A. Contractor Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity; these services include those specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the Contract Sum.

1. The Contractor shall employ and pay an independent agency, to perform specified quality control services specified in PART 1 - GENERAL, QUALITY ASSURANCE. The cost for these services is not borne by the testing allowance.

2. The Owner will engage the services of an independent agency to perform inspections and tests specified in PART 3 - EXECUTION, QUALITY CONTROL, QUALITY CONTROL TESTING DURING CONSTRUCTION or FIELD QUALITY CONTROL. Payment for these services will be made from the Inspection and Testing Allowance, as authorized by Change Orders.

a. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless otherwise agreed in writing with the Owner.

3. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

4. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

e. Security and protection of samples and test equipment at the Project site.

B. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.

1. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.

C. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.

3. The agency shall not perform any duties of the Contractor.

D. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. Additionally, Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.4 SUBMITTALS

A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Architect, in duplicate, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

   a. Date of issue.
   b. Project title and number.
   c. Name, address and telephone number of testing agency.
   d. Dates and locations of samples and tests or inspections.
   e. Names of individuals making the inspection or test.
   f. Designation of the Work and test method.
   g. Identification of product and Specification Section.
   h. Complete inspection or test data.
   i. Test results and an interpretation of test results.
   j. Ambient conditions at the time of sample-taking and testing.
   k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
   l. Name and signature of laboratory inspector.
   m. Recommendations on retesting.

1.5 QUALITY ASSURANCE
A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

PART 2 – PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching."

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 014500
SECTION 01 4529 - TESTING LABORATORY SERVICES

PART 1 GENERAL

1.1 SCOPE

   A. A qualified independent testing and inspection agency, selected and retained by the Owner and approved by Architect, will perform Special Inspection, material testing and other laboratory services specified herein.

   B. Testing and inspection agency shall make and perform all Special Inspections and structural tests in accordance with the rules and regulations of Building Code, local authorities, specifications of ASTM, and these Contract Documents.

   C. Materials and workmanship not meeting required standards or performance obligations are to be removed and replaced. Replacement and subsequent testing shall be at Contractor’s expense.

   D. Where the term “Laboratory” is used, it means the approved testing and inspection agency engaged by the Owner. Where the term “Special Inspector” is used, it means the designated and accredited Special Inspector employed by or affiliated with the Laboratory.

   E. Where the term “Geotechnical Service” is used, it means an agency specializing in soil analysis and professional geotechnical engineering, which is under the direction of a licensed engineer or licensed geologist and which is retained by the Owner for construction phase testing and inspection of foundation construction and earthwork. It may be the same agency as the laboratory.

   F. Where the term “Geotechnical Engineer” is used, it means the licensed design professional in responsible charge of the subsurface investigation and report from which the building foundation system is derived. He may be a member of the geotechnical service engaged by the Owner to perform construction phase services.

   G. Testing, inspection, and certifications specified in other sections of these Specifications shall be paid by Contractor, unless otherwise indicated, and shall be by agencies approved by Architect.

   H. Laboratory inspection shall not relieve Contractor or fabricator of its responsibility to furnish materials and workmanship in accordance with Contract Documents.

1.2 QUALIFICATIONS

   A. The testing and inspection agency shall meet all requirements of ASTM E 329, "Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction" and ASTM E 543, "Standard Practice for Agencies Performing Nondestructive Testing." Special Inspectors shall be qualified persons who have demonstrated competence to the satisfaction of the building official for inspection of the particular type of construction requiring Special Inspection.

   B. The testing and inspection agency shall each be insured against errors and omissions by a professional liability insurance policy having a limit of liability not less than $2,000,000.00.

   C. All Special Inspection and Testing services shall be under the direction of a Professional Engineer licensed in the State of Texas, charged with engineering managerial responsibility and having at least 5 years engineering experience in Special Inspection and testing of construction materials.

   D. Special Inspectors monitoring concrete work shall be ACI certified inspectors.
E. Special Inspectors performing structural steel inspection shall be currently certified AWS Certified Welding Inspectors (CWI), in accordance with provisions of AWS QC1, "Standard and Guide for Qualification and Certification of Welding Inspectors." Special Inspector may be supported by assistant Special Inspectors who may perform specific inspection functions under supervision of the Special Inspector. Assistant Special Inspectors shall be currently certified AWS Certified Associate Welding Inspectors (CAWI). Work of Assistant Special Inspectors shall be regularly monitored by the Special Inspector, generally on a daily basis.

F. Prior to start of Work, submit agency name, address and telephone number, name of full time licensed Engineer in responsible charge, and name of each Special Inspector who will inspect the work.

G. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.3 RESPONSIBILITIES OF CONTRACTOR

A. See respective technical sections for specific requirements.

B. Deliver to the laboratory, without cost to Owner, adequate quantities of representative samples of materials proposed for use which are required to be tested.

C. Advise inspecting agency and Architect sufficiently in advance of construction operations to allow inspecting agency to assign personnel for Special Inspection and testing as specified.

D. Notify inspecting agency of each day’s construction operations expected to require Special Inspection, at least 24 hours in advance of such operations, to allow Special Inspector to complete any required checks or tests in a timely manner.

E. Provide adequate facilities for safe storage and proper curing of concrete test samples on project site for the first 24 hours and also for subsequent field curing, as required by ASTM C 31.

F. Furnish such nominal labor and equipment as is required to assist laboratory personnel in obtaining and handling samples at the site and in accessing work for Special Inspection.

G. Furnish concrete mix designs, in accordance with ACI 301, Section 4.2, made by an independent testing laboratory or qualified concrete supplier. Where mix designs by an independent testing laboratory are required, laboratory shall be selected and paid by Contractor.

H. Obtain required inspections or approvals by Building Official. All inspection requests and notifications required by Building Code Section 109 are responsibility of Contractor.

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

J. Furnish fabrication/erection inspection and testing of all welds in accordance with AWS D1.1, Chapter 6.

K. Submit prequalification of all welding procedures to be used in executing the work.

L. Review and sign the Statement of Special Inspections in conjunction with other responsible parties prior to the initiation of construction.

1.4 AUTHORITY AND DUTIES OF SPECIAL INSPECTOR AND TESTING LABORATORY

A. Special Inspector shall keep records of inspections. The special inspector shall furnish inspection reports to the building official, Contractor, Architect (the registered design professional in responsible charge), and Engineer.
1. Reports shall indicate that work inspected was done in conformance with approved construction documents.
2. Discrepancies shall be brought immediately to the attention of the contractor for correction.
3. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the Architect prior to the completion of that phase of the work.
4. A final report documenting required Special Inspections and correction of any discrepancies shall be submitted at a date to be agreed upon prior to the start of work, by the permit applicant and the building official.

B. Perform all Special Inspection and testing duties as required by Chapter 17 of the International Building Code and as herein specified.

C. Special Inspectors or other representatives of the testing agency, who have reviewed and are familiar with the project and specifications, shall participate in all preconstruction conferences. They shall coordinate material testing and Special Inspection requirements with Contractor and his subcontractors consistent with planned construction schedule. They shall also attend, throughout the course of the project, such conferences as may be required or requested to address quality control issues.

D. Test and/or inspect the work assigned for conformance with the approved construction documents, specifications and applicable material and workmanship provisions of the building code. Perform testing and inspection in a timely manner to avoid delay of the work.

E. Obtain a copy of current approved Contract Documents, including addenda, from the Owner or Architect for use during inspections.

F. Submit test and/or inspection reports to the Building Official, Contractor, the Architect, the Structural Engineer of Record and other designated persons in accordance with the schedule in the Statement of Special Inspections.

G. Review and sign the Statement of Special Inspections in conjunction with other responsible parties prior to the initiation of construction.

H. Special Inspectors are not authorized to revoke, alter, relax, enlarge, or release any requirement of the Contract Documents or to approve or accept any portion of work, except where such approval is specifically called for in Specifications.

I. Special Inspectors do not act as foremen, or perform other duties for Contractor. Work will be checked as it progresses, but failure to detect any defective work or materials shall not, in any way, prevent later rejection when such defect is discovered.

1.5 SUBMITTALS

A. Distribute copies of reports of each and every inspection as described above. In addition, copy concrete cylinder break reports to concrete supplier.

B. Test Reports Shall Include:
   1. Date issued.
   2. Project title and number.
   3. Name of inspector.
   4. Date and time of sampling or inspection.
   5. Identification of product and specifications section.
   6. Location in the Project.
   7. Type of test/inspection.
   8. Date of test/inspection.
   9. Results of test/inspection.
11. When requested by Architect, provide interpretation of results.

C. In addition to furnishing a written report, notify Contractor verbally of any uncorrected conditions or failures to comply with requirements of Contract Documents and immediately fax or email corresponding report to Architect and Engineer.

D. At completion of each trade or branch of work requiring inspecting and/or testing, submit an interim report attesting to satisfactory completion of that work and full compliance with requirements of Contract Documents.

E. Upon completion of all work which requires Special Inspection, submit a final report documenting required Special Inspections and correction of any deficiencies noted in the inspections. Final report shall bear the seal of the supervising licensed engineer for the testing and inspection agency.

F. Submit copies of test results, sealed by a Licensed Engineer, to municipal authorities having jurisdiction, as they may require or request.

1.6 REFERENCED STANDARDS

A. Latest adopted edition of all standards referenced in this Section shall apply, unless noted otherwise. In case of conflict between these Contract Documents and a referenced standard, Contract Documents shall govern. In case of conflict between these Contract Documents and the Building Code, the more stringent shall govern.

B. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

C. ASTM C 1093 - Standard Practice for Accreditation of Testing Agencies for Unit Masonry.


PART 2 PRODUCTS

NOT USED

PART 3 SCHEDULE OF TESTS AND INSPECTIONS

3.1 EXISTING CONDITIONS

A. The Special Inspector shall examine the existing structure in areas where new construction will tie in as defined on the Drawings.

1. Existing bolted connections: Identify missing, damaged or otherwise deteriorated bolts and connection plates.

2. Existing welded connections: Verify that welds were completed and are still in good condition, suitable for support of additional loads shown on Drawings.

3. General condition of framing in areas to be loaded or altered. Configuration and evidence of excessive corrosion or other damage shall be reported.

B. Work with the Contractor in regard to accessibility and removal of finishes to permit visual examination of affected areas.

C. Provide a report indicating acceptability of existing framing before new construction begins.
3.2 EXCAVATION

A. The Owner’s geotechnical consultant, acting as Special Inspector, shall provide services herein specified.

B. Observe the excavation process, exposed faces of excavation and installation of retention systems. Check for compliance with Contract Documents and make alternative recommendations as may be required to suit field conditions.

C. Review all geotechnical parameters and assumptions used in the development of calculations and Drawings for retention systems, including lateral design forces rock wedge stability analysis, rock bolt lengths and spacing, and surcharge effects.

D. Review all required submittals pertaining to geotechnical requirements.

E. Check adequacy and accuracy of Contractor’s monitoring program, equipment, procedures, and measurements related to movements of the excavated face and adjacent structures.

F. Immediately report any observed unsafe conditions. Request additional shoring, bracing, or rock bolting where judged to be necessary as excavation progresses.

3.3 PIER DRILLING OPERATION

A. The Owner’s geotechnical consultant, acting as Special Inspector, shall provide services herein specified.

B. Special Inspector shall make continuous inspections of drilled pier construction to check the following for compliance with the approved soils report and the Contract Documents:
   1. Verify soundness of bearing stratum and desired penetration.
   2. Verify placement locations, plumbness and pier dimensions including shaft diameter, bell diameter and length.
   3. Verify reinforcing steel size, grade, quantity and placement.
   5. Verify compliance with specified time limit regarding how long holes are permitted to stand open and exposed to air before placing concrete.
   6. Monitor placement of concrete and use of tremie or pumps.
   7. Monitor extraction of casing, if used.

C. Special Inspector shall furnish complete pier log showing diameter, bell size, top and bottom elevations of each pier, casing required or not required, actual penetration into bearing stratum, elevation of top of bearing stratum, volume of concrete used, and deviations from specified tolerances.

D. Request probe holes when deemed necessary to confirm safe bearing capacity.

3.4 FILLING AND BACKFILLING

A. The Owner’s geotechnical consultant, acting as Special Inspector, shall provide services herein specified.

B. Contractor shall make available, free of charge, adequate samples of each fill and backfill material from proposed sources of supply.

C. A 50 pound sample of each type of off-site and site-excavated material proposed for use shall be given to the geotechnical service by Contractor between 10 and 30 calendar days prior to start of specified work. Analyze samples as required to provide a soil description and to determine compliance with gradation and quality requirements, and test as follows:
   1. Tests for liquid limit of soils in accordance with ASTM D 4318.
2. Tests for plastic limit of soils and plasticity index of soils in accordance with ASTM D 4318.
3. Tests for moisture/density relations of soil in accordance with ASTM D 698 or D 1557, as applicable.

D. Furnish a report for each individual test, describing variances from specified requirements and stating whether material is acceptable for intended use.

E. Inspect underslab drainage material and placement for compliance with specified gradation, quality, and compaction.

F. Inspect excavated subgrade, confirm elevation, and identify to Contractor any remaining unsuitable material which must be removed, and any soft areas which must be recompacted.

G. Inspect and test prepared subgrade after initial rolling and compaction of scarified surface, before the placement of any fill.

H. Continuously inspect placement lift thickness and compaction of all fill materials, including continuous inspection of moisture conditioning of on-site soils. Verify fill material compliance with specified material properties.

I. Make in-place compaction test for moisture content and density relations, and density of materials-in-place to determine that backfill and fill materials have been compacted to specified density. Tests shall be made at the following frequencies:
   1. 1 test for each 5000 square feet of area of each lift placed under building or floor slab. Stagger test locations in each lift from those in previous lift. A minimum of 3 tests will be required of each lift.
   2. 1 test for each 100 linear feet, or portion thereof, of each lift placed against foundation walls, with locations staggered as above.
   3. 1 test of each lift placed below any isolated footing or similar support and every 100 linear feet under continuous footings, with locations taken on a different side in each case, from the lift below.

J. Check and report on compliance with the approved soils report and the Contract Documents. Reports may be combined on a daily basis, if desired, provided that location of each test and applicable lift are clearly identified and any problems are detailed.

3.5 FOOTING EXCAVATIONS

A. The Owner’s geotechnical service shall provide a Special Inspector who shall periodically inspect each concrete footing excavation to determine that proper bearing stratum is obtained, that material below footings is adequate to achieve the design bearing capacity, and that excavations are properly clean and dry before concrete is placed.

B. The Special Inspector shall observe, on a full time basis, drilling of probe holes for footings. Immediately advise Owner and Contractor of any necessary adjustments to footings as a result of poor rock conditions or voids.

3.6 CARTON FORM INSPECTION

A. Inspect carton forms for size, installation and integrity before each concrete pour.
   1. Confirm that the carton forms are the detailed width and depth.
   2. Confirm that all carton forms are solid and that all wet or damaged cartons have been removed prior to placing concrete.
   3. Confirm ends of cartons are properly capped and joints are properly sealed per specifications.
   4. Confirm round pier forms are being used per specifications and voids are properly formed under pilasters.
B. Confirm protection board has been properly installed over slab voids prior to placement of vapor retarder.

C. If soffit of beams have been wood formed or formed with square cartons, confirm that the detailed void space has been maintained prior to installation of retainers with a tolerance of +/- 1”.

D. Confirm retainers are the proper size and have been properly installed per details prior to any backfilling operations.

3.7 CONCRETE REINFORCING STEEL AND EMBEDDED METAL ASSEMBLIES

A. A Special Inspector shall perform testing and inspection specified herein.

B. Welds shall be inspected by a certified welding inspector.

C. Inspect all concrete reinforcing steel prior to placing of concrete for compliance with Contract Documents and approved shop drawings.

D. Observe and Report on the Following:
   1. Number and size of bars. Include spacing of stirrups and column ties.
   2. Bending and lengths of bars.
   4. Clearance to forms including chair heights.
   5. Clearance to sides and bottom of trench if soil-formed.
   6. Clearance between bars or spacing.
   7. Rust, form oil, and other contamination.
   8. Grade of steel. Verify that reinforcing being welded is ASTM A 706.
  10. Excessive congestion of reinforcing steel.
  11. Installation of anchor rods and placement of concrete around such rods.
  12. Fabrication and installation of embedded metal assemblies, including visual inspection of all welds.
  13. Visually inspect studs and deformed bar anchors on embedded assemblies for compliance with Contract Documents. Check number, spacing and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360° fillet has not been obtained for a particular stud or bar, such stud or bar shall be struck with a hammer and bent 15° off perpendicular and then bent back into position. Anchors failing this test shall be replaced.
  14. Shear head assemblies at columns in flat plate slabs, including condition, size, number and spacing of studs, bars or supports. Confirm proper placement, clearances, concrete cover and quality of welds.

3.8 CONCRETE INSPECTION AND TESTING

A. A Special Inspector shall perform testing and inspection specified herein, unless otherwise noted. Comply with ACI 311, "Guide For Concrete Inspection" and "ACI Manual of Concrete Inspection" (SP-2).

B. Receive and evaluate all proposed concrete mix designs submitted by Contractor. If mix designs comply with Drawings and Specifications, laboratory shall submit a letter to Architect certifying compliance. Mix designs not complying with Drawings and Specifications shall be returned by laboratory as unacceptable.

C. Periodically inspect formwork for shape, location and dimensions of the concrete member being formed.

D. Verify use of the required mix design.
E. Secure composite samples of concrete at the jobsite in accordance with ASTM C 172.

F. Mold and cure the number of specimens required by code plus one from each sample in accordance with ASTM C 31 (ACI 318-08 stipulates that two 6” x 12” cylinders are required for a compressive strength test, but requires three 4” x 8” cylinders for that same test). Supervise curing and protection provided (by others) for test specimens in field, and transportation from field to laboratory. Test cylinders shall be stored in the field 24 hours and then be carefully transported to laboratory and cured in accordance with ASTM C 31.

G. Test specimens in accordance with ASTM C 39. 2 or 3 specimens (depending on specimen size) shall be tested at 28 days for acceptance and 1 shall be tested at 7 days for information.

H. For concrete placed in piers, make 1 strength test (code required number of cylinders plus 1) for each pier, but not more than 1 test for each truckload.

I. For concrete other than that placed in piers, make 1 strength test (code required number of cylinders plus 1) for each 100 cubic yards, or fraction thereof, of each mix design of concrete placed in any 1 day.

J. Make 1 slump test for each set of cylinders following procedural requirements of ASTM C 143 and C 172. Make additional slump tests whenever consistency of concrete appears to vary. Do not permit placement of concrete having a measured slump outside limits given on Drawings, except when approved by Architect. Slump tests corresponding to samples from which strength tests are made shall be reported with strength test results. Other slump tests need not be reported.

K. Determine total air content of air entrained normal-weight concrete sample for each strength test in accordance with ASTM C 231.

L. Determine temperature of concrete sample for each strength test.

M. Determine air content and unit weight of lightweight concrete sample for each strength test in accordance with ASTM C 173 and C 567.

N. Testing agency shall provide a competent inspector at the batch plant to observe the mixing of the first batch of each mix design destined for the project. Inspector shall examine concrete materials for compliance with Specifications and approved mix design, weighing and measuring devices, proportioning and mixing of materials, water and cement content, general operation of plant, and transportation of concrete to jobsite. Inspector shall verify that amount of free surface moisture contained in both fine and coarse aggregate has been properly accounted for in concrete proportioning to achieve required consistency and water cement ratio. Once proper procedures and quality assurance program have been confirmed by the inspector, in-plant inspections may cease.

O. Monitor addition of water to concrete at jobsite and length of time concrete is allowed to remain in the truck before placement. Inspector shall compare mixture with criteria on approved mix design and report any significant deviation to Architect, Contractor and concrete supplier. Do not permit addition of water which will exceed maximum water/cement ratio for the mix as given on approved mix design.

P. Continuously observe placing of all concrete, except non-structural slabs-on-grade and sitework. Observe and report on placing method, consolidation, cold joints, length of drop, and displacement of reinforcement.

Q. Certify each delivery ticket indicating class of concrete delivered (or poured), amount of water added and time at which cement and aggregate was dispensed into truck, and time at which concrete was discharged from truck.

R. Evaluation and Acceptance:
1. If measured slump, or air content of air entrained concrete, falls outside specified limits a check test shall be made immediately on another portion of same sample. In the event of a second failure, concrete shall be considered to have failed to meet requirements of the specifications, and shall not be used in structure.

2. Strength level of concrete will be considered satisfactory if averages of all sets of 3 consecutive strength test results are equal to, or exceed, specified strength and no individual test result (average of 2 or 3 specimens, depending on specimen size, as specified, above) is below specified strength by more than 500 psi.

S. Concrete Test Reports:
   1. Reports shall be made and distributed immediately after respective tests or inspections are made.
   2. Where reports indicate deviations from Contract Documents, they shall also include a determination of probable cause of deviation and, where applicable, a recommendation for corrective action.
   3. Whenever testing laboratory recognizes a trend of decreasing quality in concrete due to changing seasons, conditions of curing, or other cause, this shall be brought to Architects attention, along with a recommendation for corrective action to be taken before materials fall below requirements of Specifications.

T. Periodically inspect application of curing compound and monitor curing temperature and techniques for compliance with specified requirements.

U. The Testing Laboratory Shall Measure Concrete Floor Flatness and Levelness:
   1. Measurement standard: Floors shall be measured for flatness and levelness to determine compliance with the tolerances provided in Section 03 3000.
   2. Time period for measurement and reporting: All measurements shall be made by Owner's testing laboratory or designated party before the end of the next workday, after completion of finishing operations. For structural elevated floors, measurement shall also be made prior to removal of forms and shores. Contractor shall be notified immediately after measurements of any section are complete, and a written report of floor measurement results shall be submitted within 72 hours after finishing operations are complete. Contractor shall take immediate action to correct any work that is outside specified tolerances.
   3. Take measurements along orthogonal lines covering the entire area to be tested. Measuring equipment and pattern shall be as specified in section 03 3000.

3.9 CAST-IN BOLTS

A. Provide a qualified, experienced Special Inspector to inspect installation of cast-in bolts where such bolts are identified as requiring Special Inspection in the contract documents. Inspection shall be continuous and include verification of bolt size, material, placement, and adequate consolidation of concrete around bolt for conformance with the contract requirements.

3.10 DRILLED-IN ANCHOR BOLTS AND DOWELS

A. Provide a qualified, experienced Special Inspector to inspect drilling of each hole and installation of each anchor, including location, hole size, hole preparation and cleaning, number, spacing, edge distance, embedment, anchor size, installation of grout or adhesive (where applicable) and anchor installation procedures for compliance with contract documents and with printed instructions of manufacturer.

B. Special Inspector shall verify installation torque for each expansion bolt for compliance with manufacturer's installation instructions.

3.11 MASONRY

A. Inspection:
1. A Special Inspector shall perform testing and inspection specified herein on a periodic basis, except where otherwise noted. Inspect work in progress at least once for each 5000 square feet of wall laid, but not less than once each day, to check compliance with Contract Documents and applicable Building Code. The frequency of inspection shall conform to the requirements of the Building Code for a nonessential facility.

2. Inspect the following:
   a. Proportions of site-prepared mortar.
   b. Construction of mortar joints.
   c. Location of reinforcement, connectors, prestressing tendons and anchorages.
   d. Prestressing technique.
   e. Grade and size of prestressing tendons and anchorages.
   f. Size and location of structural elements.
   g. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.
   h. Specified size, grade and type of reinforcement.
   i. Welding of reinforcing bars (continuous inspection).
   j. Protection of masonry during cold weather (temperature below 40° F) or hot weather (temperature above 90° F).
   k. Application and measurement of prestressing force.
   l. Grout spaces (prior to grouting and prior to closing cleanouts).
   m. Placement of reinforcement and connectors and prestressing tendons and anchorages.
   n. Proportions of site-prepared grout and prestressing grout for bonded tendons.
   o. Construction of mortar joints.
   p. Grout placement (continuous inspection).
   q. Grouting of prestressing bonded tendons (continuous inspection).
   r. Preparation of required grout specimens, mortar specimens, and/or prisms for testing (continuous inspection).
   s. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.

3. Provide a report of each inspection.

B. Prism Tests:
1. Make prism tests in advance of operations using materials under same conditions and with same bonding arrangement as for structure. Observe and inspect actual construction of prisms. Moisture content of unit at time of laying, consistency of mortar, and width and thickness of mortar joints shall be same as used in structure.

2. Cure and test prisms in accordance with applicable provisions of ASTM C 1314. Test 5 specimens of each type of masonry unit before delivering material to jobsite and submit results for approval. During construction, test 3 specimens of each type of masonry unit for each 5000 square feet of wall placed.

3. Standard age of test specimens is 28 days, but 7 day tests may be used, provided relationship between 7 day and 28 day strengths is established by test for materials used.

4. Build prisms of hollow masonry units the same width as unit by 16" long in plan and 16" high, using specified masonry units, applying mortar to only face shells. Do not fill hollow core with grout. Compute value of ultimate net compressive strength by dividing ultimate load by net face shell area of masonry units (length X twice face shell thickness).

5. Build brick prisms 1 brick width and length in plan and 5 bricks high, using full bed joints as specified. Compute ultimate compressive strength by dividing ultimate load by net area of masonry units.

6. Build prisms on job using same materials and methods as for wall construction. Store prisms in a place where they will be undisturbed for 2 days and have approximately same curing conditions as wall construction. After 2 days, transport to laboratory in a manner which will not disturb mortar bond and then cure and test as set forth under ASTM C 1314.
7. When average strength of a set of prisms falls below specified compressive strength (F’m), masonry corresponding to the test shall be deemed unacceptable. In such case, notify Architect and Contractor immediately.

3.12 STRUCTURAL STEEL

A. A Special Inspector shall inspect structural steel during fabrication and during and after erection for conformance with Contract Documents and shop drawings. Review and report on fabricator’s quality control procedures and capabilities.

B. Shop Inspection (In accordance with the Code, Special Inspections are not required where the work is done on the premises of a fabricator registered and approved to perform such work without Special Inspection. At completion of fabrication, the approved fabricator shall submit a certificate of compliance to the building official stating that the work was performed in accordance with the approved construction documents.):
1. Verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator’s ability to conform to approved construction documents and referenced standards. Review procedures for completeness and adequacy relative to the code requirements for the fabricator’s scope of work.
2. Periodic inspection of fabrication process, including verifying markings on bolts, nuts and washers to comply with ASTM standards and welding to monitor effectiveness of quality control program. Inspection of shop welding to be “verification inspection,” in accordance with AWS D1.1, Chapter 6.
3. Continuous inspection of complete and partial penetration groove welds, multi-pass fillet welds and single-pass fillet welds greater than 5/16”.
4. Review manufacturer’s certificate of compliance for bolts, structural steel, and weld filler materials.
5. Ultrasonic testing of all full penetration welds.
6. Ultrasonic testing of all plates over 1 1/2” thick.
7. Examination of installation of shop welded shear studs.

C. Field Inspection:
1. Proper erection of all pieces.
2. Proper installation of all bolts, including checking of calibration of impact wrenches used with high-strength bolts. See Paragraph E (Inspection of Bolted Construction), below.
3. Details of bracing and stiffening.
4. Continuous inspection of welding process for penetration welds and fillet welds larger than 5/16”, and periodic inspection of all other welding while in progress. See Paragraph F (Inspection of Field Welding), below.
5. Application of joint details at each connection.
6. Inspect all shop fabricated members, upon arrival at jobsite, for member straightness and alignment and for defects incurred during transit and handling.
7. Measure and record camber of all beams upon arrival and before erection for compliance with specified camber. Measure lying flat with web horizontal. Members outside specified camber tolerance shall be returned to shop for correction.
8. Plumbness of structure and proper bracing.
10. Proper grouting of column base plates.
11. Proper painting and galvanizing.

D. Qualifications of Welders: Fabricator and erector shall provide testing laboratory with names of welders to be employed on work, along with certification that each welder has passed qualification tests within the last year, using procedures covered in American Welding Society “Structural Welding Code - Steel,” D1.1, latest edition. Verify all welder qualifications.
E. Inspection of Bolted Construction Shall be in Accordance with AISC Specification for Structural Steel Buildings and as Follows:

1. All bolts shall be visually inspected to ensure plies have been brought into snug contact.
2. High strength bolting shall be inspected in accordance with Section 9 of "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts."
3. For all high strength bolts, unless specifically noted on Drawings to require only "snug-tight" installation, inspector shall observe required jobsite testing and calibration, and shall confirm procedure to be used does provide required tension. He then shall monitor the work to assure tested procedures are routinely followed. Tightening by calibrated wrench and turn-of-the-nut method without match-marking shall be continuously inspected.
4. For slip-critical connections, inspect contact surfaces for compliance with specifications prior to bolting.
5. Verify markings on bolts, nuts and washers to comply with ASTM Standards.

F. Inspection of Field Welding Shall Include the Following:

1. Visually inspect fillet welds for size, soundness, and proper return around ends. Check for seams, folds, and delaminations.
2. Ultrasonically test all penetration welds in accordance with ASTM E 164.
3. Inspect surfaces to be welded. Surface preparations, fit-up and cleanliness of surface shall be noted. Electrodes shall be checked for size, type and condition.
4. Welding inspector shall be present during alignment and fit-up of members being welded, and shall check for correct surface preparation of root openings, sound weld metal, and proper penetration in root pass. Where weld has not penetrated completely, inspector shall order joint to be chipped down to sound metal, or gouged out, and rewelded. Root passes shall be thoroughly inspected for cracks. All cracks shall be gouged out and rewelded to 2" beyond each end of crack.
5. Inspector shall check that all welds have been marked with welder's symbol and shall mark welds requiring repairs and shall make a reinspektion. Inspector shall maintain a written record of all welds. Work completed and inspected shall receive an identification mark by the inspector. Unacceptable material and work shall be identified by word "reject" or "repair" marked directly on material.
6. Testing agency shall advise Owner and Architect of any shop and/or field conditions which, in his opinion, may require further tests and examination by means other than specified. Such further tests and examinations shall be performed as authorized by Owner and Architect.
7. Owner reserves the right to use ultrasonic or radiographic inspection to verify adequacy of all welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1.

G. Inspection of Stud Welding Shall be in Accordance with Section 7.8, of the AWS Structural Welding Code, D1.1., and as Follows:

1. A minimum of 2 shear studs shall be welded at start of each production period in order to determine proper generator, control unit and stud welder setting. These studs shall be capable of being bent 45° from vertical without weld failure.
2. When temperature is below 32° F., 1 stud in each 100 shall be tested after cooling. Stubs shall not be welded below 0° F. or when surface is wet with rain or snow. If stud fails in weld, 2 new studs shall pass the test before resumption of welding.
3. Visually inspect studs for compliance with Contract Documents. Check number, spacing, and weld quality. If, after welding, visual inspection reveals a sound weld or a full 360° fillet has not been obtained for a particular stud, such stud shall be struck with a hammer and bent 15° off perpendicular in the direction away from missing weld. Studs failing this test shall be replaced.

3.13 OPEN WEB JOISTS AND JOIST GIRDERS
A. Inspect all joists either in plant or at jobsite for conformance with specified fabrication requirements. Check welded connections between web and chord, splices, and straightness of members.

B. Inspect installation of joists at jobsite. Check connections to supporting members, chord extensions, number of rows of bridging, and bridging connections for conformance with Contract Documents and referenced standards.

C. Inspect manufacturer’s certificate of compliance.

D. Check welder qualification certificates for both shop and field welding operators.

3.14 METAL FLOOR DECK

A. Field Inspection Shall Consist of the Following:
   1. Check types, gauges and finishes for conformance with Contract Documents and shop drawings.
   2. Examination for proper erection of all metal deck, fastenings, reinforcing of holes, deck reinforcing, miscellaneous deck supports, hanger tabs, shear studs, deck closures, painting or other coating.
   3. Certification of welders.
   4. Special Inspector shall inspect all floor deck welds, including field welded shear studs used to fasten metal floor decking to supporting steel. Field welded shear studs shall be inspected and tested as described in the paragraph addressing structural steel.

3.15 METAL ROOF DECK

A. Field Inspection Shall Consist of the Following:
   1. Checking types, gauges, and finishes for conformance with Contract Documents and shop drawings.
   2. Examination for proper erection of all metal deck, including fastenings at supports and side laps, reinforcing of holes, and miscellaneous deck supports.
   3. Certification of welders, under AWS D1.3 “Structural Welding Code - Sheet Steel”.
   4. Special Inspector shall periodically inspect roof deck welds. Visual inspection of at least 25% of all welds is required at a minimum.

END OF SECTION
SECTION 015000 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

B. Temporary utilities which may be required include but are not limited to:
   1. Water service and distribution.
   2. Temporary electric power and light.
   3. Telephone service.
   4. Storm and sanitary sewer.

C. Temporary construction and support facilities which may be required include but are not limited to:
   1. Temporary heat.
   2. Storage sheds and field offices.
   3. Temporary roads and paving.
   4. Sanitary facilities, including drinking water.
   5. Dewatering facilities and drains.
   6. Temporary enclosures.
   7. Hoists and temporary elevator use.
   8. Temporary Project identification signs and bulletin boards.
   9. Waste disposal services.
   10. Rodent and pest control.
   11. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities which may be required include but are not limited to:
   1. Temporary fire protection.
   2. Barricades, warning signs, lights.
   3. Sidewalk bridge or enclosure fence for the site.
   4. Environmental protection.

E. Refer to drawing at end of this Section for Temporary Site Sign.

1.3 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Submit a schedule indicating implementation and termination of each temporary utility within 15 days of the date established for commencement of the Work.

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:
   1. Building Code requirements.
   2. Health and safety regulations.
   3. Utility company regulations.
   4. Police, Fire Department and Rescue Squad rules.
   5. Environmental protection regulations.

   1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
   2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."

   1. For job-built temporary offices, shops and sheds within the construction area, provide UL labeled, fire treated lumber and plywood for framing, sheathing and siding.
   2. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated.
   3. For fences and vision barriers, provide exterior type, minimum 3/8" thick plywood.
   4. For safety barriers, sidewalk bridges and similar uses, provide minimum 5/8 inch thick exterior plywood.

C. Paint: Comply with requirements of Division 9 Section "Painting."

   1. For job-built temporary offices, shops, sheds, fences and other exposed lumber and plywood, provide exterior grade acrylic-latex emulsion over exterior primer.
   2. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.

D. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

E. Water: Provide potable water approved by local health authorities.


2.2 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4 inch heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles.
at hose discharge.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

G. Temporary Offices: Provide prefabricated or mobile units with lockable entrances, operable windows and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

H. Temporary Storage Sheds: Provide prefabricated or mobile units with lockable entrances. Provide heated units on foundations adequate for normal loading.

I. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

J. First Aid Supplies: Comply with governing regulations.

K. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.

1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect, and will not be accepted as a basis of claims for a Change Order.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction
1. Sterilization: Sterilize temporary water piping prior to use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.

1. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

D. Temporary Lighting: Wherever overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.

E. Temporary Telephones: Provide temporary telephone service for use by all personnel engaged in construction activities. Where field offices are required, provide temporary telephone service consisting of a minimum of two separate telephone lines (one line dedicated for facsimile machine) in the field office for use by personnel engaged in construction activities throughout the construction period. Provide internet access for email in the field office.

F. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Connect temporary sewers to the municipal system as directed by the sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.
4. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.

1. Maintain temporary construction and support facilities until Final Completion. Remove prior to final application for payment. Where temporary construction or facilities interfere with the Owner’s use or occupation of the Work after Substantial Completion, remove, relocate, or modify temporary construction and facilities as required to permit Owner’s use and occupancy.

B. Provide incombustible construction for offices, shops and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.

C. Temporary Heat: Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

D. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.

E. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:

1. Provide with at least one toilet room with running water, connected to the sanitary sewer.
2. Furnish with at least two desks and chairs, a 4 drawer file cabinet, plan table and plan rack, a 6 shelf bookcase, conference table and chairs, fax machine and a desktop computer with modem and printer.

F. Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service.

G. Temporary Paving: Construct and maintain temporary roads and paving to adequately support the indicated loading and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Architect.

1. Paving: Comply with Division 32 Section “Asphaltic Concrete Paving” for construction and maintenance of temporary paving.
2. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.
3. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas that are without damage or deterioration when occupied by the Owner.
4. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration and supervision.

H. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best service the Project's needs.

1. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

I. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

J. Drinking Water Fixtures: Provide drinking water fountains where required to for compliance with regulations and health codes, including paper supply.

K. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 32 and Division 33 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations and construction free of water.

L. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.
4. Where temporary wood or plywood enclosure exceeds 100 square feet in area, use UL-labeled fire-retardant treated material for framing and main sheathing.

M. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

N. Project Identification and Temporary Signs: Display no signs without approval of the Architect. Do not permit installation of unauthorized signs.

O. Project Identification Signs: Engage an experienced sign painter to apply graphics. Refer to drawing at end of this Section for Temporary Site Sign.

1. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

P. Temporary Exterior Lighting: Install exterior yard and sign lights so that signs are visible when Work is being performed.
Q. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

R. Rodent and Pest Control: Before deep foundation Work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be relatively free of pests and their residues at Substantial Completion. Perform control operations in a lawful manner using environmentally safe materials.

S. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by the Architect.


1. Fire Lanes: The General Contractor shall provide and maintain temporary "all-weather" emergency vehicle access adjacent to roads designated by the Contract Documents as Fire Lanes, as required by the authorities having jurisdiction until complete construction of all fire lanes. Fire lanes shall be maintained and remain accessible at all times.

2. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.

3. Store combustible materials in containers in fire-safe locations.

4. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

5. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

C. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

D. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

E. Enclosure Fence: When excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except by the entrance gates.

1. Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth.

F. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

G. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways
and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour day basis where required to achieve indicated results and to avoid possibility of damage.
   2. Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Architect requires that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

   1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.
   2. Remove temporary paving that is not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt or other petrochemical compounds, and other substances which might impair growth of plant materials or lawns. Repair or replace street paving, curbs and sidewalks at the temporary entrances and elsewhere when used during construction, as required by the governing authority, Architect and or the Owner.
   3. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to:
      a. Replace air filters and clean inside of ductwork and housings.
      b. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
      c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.
END OF SECTION 015000
PART 1   GENERAL

1.01 SUMMARY
The work consists of implementing the storm water pollution prevention measures to prevent sediment from entering streams or water bodies as specified in this Section in conformance with the requirements of the Texas Commission on Environmental Quality and the requirements of the National Pollutant Discharge Elimination System (NPDES).

1.02 REFERENCES
The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D4439 (2011) Geosynthetics
ASTM D4491 (1999a; R 2009) Water Permeability of Geotextiles by Permittivity
ASTM D4533 (2011) Trapezoid Tearing Strength of Geotextiles
ASTM D4873 (2002; R 2009) Identification, Storage, and Handling of Geosynthetic Rolls and Samples

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)


U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 122.26 Storm Water Discharges (Applicable to State NPDES Programs, see section 123.25)

1.03 EROSION AND SEDIMENT CONTROLS
The controls and measures required of the Contractor are described below.

A. Stabilization Practices
The stabilization practices to be implemented include temporary seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, erosion control mats, protection of trees, preservation of mature vegetation, etc. Maintain a log of construction activities and record the dates when the major grading activities occur. (e.g., clearing and grubbing, excavation, embankment, and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraphs UNSUITABLE CONDITIONS and NO ACTIVITY FOR LESS THAN 21 DAYS, initiate stabilization practices as soon as practicable, but no more than 14 days, in any portion of the site where construction activities have temporarily or permanently ceased.
1. Unsuitable Conditions
   Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases or is precluded by unsuitable conditions caused by the weather, initiate stabilization practices as soon as practicable after conditions become suitable.

2. No Activity for Less Than 21 Days
   When the total time period in which construction activity is temporarily ceased on a portion of the site is 21 days minimum, stabilization practices do not have to be initiated on that portion of the site until 14 days have elapsed after construction activity temporarily ceased.

3. Burnoff
   Burnoff of the ground cover is not permitted.

4. Protection of Erodible Soils
   Immediately finish the earthwork brought to a final grade, as indicated or specified, and protect the side slopes and back slopes upon completion of rough grading. Plan and conduct earthwork to minimize the duration of exposure of unprotected soils.

B. Erosion, Sediment and Stormwater Control
   a. Submit "Erosion and Sediment Controls" (E&S) (form provided at the pre-construction conference) and Storm Water Inspection Reports for General Permit to the Contracting Officer once every 7 calendar days and within 24 hours of a storm event that produces 0.5 inch or more of rain.

   b. NOT USED

   c. NOT USED

   d. Storm Water Notice of Intent for Construction Activities

   e. Submit a Storm Water Notice of Intent for NPDES coverage under the general permit for construction activities to the Texas Commission on Environmental Quality prior to the commencement of work. If the Plan Set does not include one, submit a Storm Water Pollution Prevention Plan (SWPPP) for the project to the Engineer. The SWPPP shall meet the requirements of the applicable regulatory agency general permit for storm water discharges from construction sites. Maintain an approved copy of the SWPPP at the construction on-site office, and continually update as regulations require, to reflect current site conditions. Include within the SWPPP:

      (1) Identify potential sources of pollution which may be reasonably expected to affect the quality of storm water discharge from the site.

      (2) Describe and ensure implementation of practices which will be used to reduce the pollutants in storm water discharge from the site.

      (3) Ensure compliance with terms of the Federal and/or State general permit for storm water discharge.

      (4) Select applicable best management practices from EPA 832-R-92-005.

      (5) Storm Water Pollution Prevention Measures and Notice of Intent 40 CFR 122.26, EPA 832-R-92-005. Provide a "Storm Water Pollution Prevention Plan" (SWPPP) for the project. The SWPPP will meet the requirements of the Federal and/or State general permit for storm water discharges from construction sites. Submit the SWPPP along with any required Notice of Intents, Notice of Termination, and appropriate permit fees, via the Contracting Officer, to the appropriate Federal and/or State agency for approval, a minimum of 14 calendar days prior to the start of construction. A copy of the approved SWPPP will be kept at the construction on-site office, and continually updated as regulations require to reflect current site conditions.
(6) Install, inspect, and maintain best management practices (BMPs) as required by the general permit. Prepare Inspection Reports as required by the general permit.

(7) Once construction is complete and the site has been stabilized with a final, sustainable cover, submit the Notice of Termination to the appropriate Federal and/or State agency within 30 days after all land disturbing activities end.

C. Stormwater Drainage
There will be no discharge of excavation ground water to the sanitary sewer, storm drains, or to the river without prior specific authorization. Discharge of hazardous substances will not be permitted under any circumstances. Construction site runoff will be prevented from entering any storm drain or the river directly by the use of straw bales or other method suitable to the Environmental Programs Division of the Shipyard. Provide erosion protection of the surrounding soils.

D. Structural Practices
Implement structural practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Implement structural practices in a timely manner, during the construction process, to minimize erosion and sediment runoff. Include the following devices; Location and details of installation and construction are shown on the drawings.

1. Silt Fences
   Provide silt fences, as shown in the plans, as a temporary structural practice to minimize erosion and sediment runoff. Properly install silt fences to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Install silt fences in the locations indicated on the drawings. Obtain approval from the Engineer prior to final removal of silt fence barriers.

2. Straw Bales
   NOT USED

3. Diversion Dikes
   NOT USED

E. Sediment Basins
   NOT USED

F. Vegetation and Mulch
   a. Provide temporary protection on sides and back slopes as soon as rough grading is completed or sufficient soil is exposed to require erosion protection. Protect slopes by accelerated growth of permanent vegetation, temporary vegetation, mulching, or netting. Stabilize slopes by hydroseeding, anchoring mulch in place, covering with anchored netting, sodding, or such combination of these and other methods necessary for effective erosion control.

   b. Seeding: Provide new seeding where ground is disturbed. Include topsoil or nutriment during the seeding operation necessary to establish or reestablish a suitable stand of grass. The seeding operation will be as specified in Section 329219 SEEDING.

1.04 SUBMITTALS
Submit the following in accordance with Section 013300 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals
   Storm Water Pollution Prevention Plan
   Storm Water Notice of Intent

SD-06 Test Reports
Storm Water Inspection Reports for General Permit
Erosion and Sediment Controls

SD-07 Certificates

Mill Certificate or Affidavit
Certificate attesting that the Contractor has met all specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING
Identify, store and handle filter fabric in accordance with ASTM D4873.

PART 2 PRODUCTS

2.01 COMPONENTS FOR SILT FENCES

A. Filter Fabric

Provide geotextile that complies with the requirements of ASTM D4439, and consists of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and contains stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure. Provide synthetic filter fabric that contains ultraviolet ray inhibitors and stabilizers to assure a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements:

<table>
<thead>
<tr>
<th>FILTER FABRIC FOR SILT SCREEN FENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICAL PROPERTY</td>
</tr>
<tr>
<td>Grab Tensile Elongation (percent)</td>
</tr>
<tr>
<td>Trapezoid Tear</td>
</tr>
<tr>
<td>Permittivity</td>
</tr>
<tr>
<td>AOS (U.S. Std Sieve)</td>
</tr>
</tbody>
</table>

B. Silt Fence Stakes and Posts
Use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 by 2 inches when oak is used and 4 by 4 inches when pine is used, and have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds/linear foot and a minimum length of 5 feet.

C. Mill Certificate or Affidavit
Provide a mill certificate or affidavit attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. Specify in the mill certificate or affidavit the actual Minimum Average Roll Values and identify the fabric supplied by roll identification numbers. Submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.
2.02 COMPONENTS FOR STRAW BALES
   NOT USED

PART 3 EXECUTION

3.01 INSTALLATION OF SILT FENCES
   Extend silt fences a minimum of 16 inches above the ground surface without exceeding 34 inches above
   the ground surface. Provide filter fabric from a continuous roll cut to the length of the barrier to avoid the
   use of joints. When joints are unavoidable, splice together filter fabric at a support post, with a minimum 6
   inch overlap, and securely sealed. Excavate trench approximately 4 inches wide and 4 inches deep on
   the upslope side of the location of the silt fence. The 4 by 4 inch trench shall be backfilled and the soil
   compacted over the filter fabric. Remove silt fences upon approval by the Contracting Officer.

3.02 INSTALLATION OF STRAW BALES
   NOT USED

3.03 FIELD QUALITY CONTROL
   Maintain the temporary and permanent vegetation, erosion and sediment control measures, and other
   protective measures in good and effective operating condition by performing routine inspections to
   determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of
   erosion and sediment control measures and other protective measures. Use the following procedures to
   maintain the protective measures.

   A. Silt Fence Maintenance
      Inspect the silt fences in accordance with paragraph, titled "Inspections," of this section. Any
      required repairs shall be made promptly. Pay close attention to the repair of damaged silt fence
      resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become
      ineffective, and the barrier is still necessary, replace the fabric promptly. Remove sediment deposits
      when deposits reach one-third of the height of the barrier. Remove a silt fence when it is no longer
      required. The immediate area occupied by the fence and any sediment deposits shall be shaped to
      an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with
      Section 320533 LANDSCAPE ESTABLISHMENT, except that the coverage requirements in
      paragraph, titled "Establishment" of this section do not apply.

   B. Straw Bale Maintenance
      NOT USED

   C. Diversion Dike Maintenance
      NOT USED

3.04 INSPECTIONS
   A. General
      Inspect disturbed areas of the construction site, areas that have not been finally stabilized used for
      storage of materials exposed to precipitation, stabilization practices, structural practices, other
      controls, and area where vehicles exit the site at least once every seven (7) calendar days and
      within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Conduct
      inspections at least once every month where sites have been finally stabilized.

   B. Inspections Details
      Inspect disturbed areas and areas used for material storage that are exposed to precipitation for
      evidence of, or the potential for, pollutants entering the drainage system. Observe erosion and
      sediment control measures identified in the Storm Water Pollution Prevention Plan to ensure that
      they are operating correctly. Inspect discharge locations or points to ascertain whether erosion
      control measures are effective in preventing significant impacts to receiving waters. Inspect
      locations where vehicles exit the site for evidence of offsite sediment tracking.

   C. Inspection Reports
      For each inspection conducted, prepare a report summarizing the scope of the inspection, name(s)
      and qualifications of personnel making the inspection, the date(s) of the inspection, major
      observations relating to the implementation of the Storm Water Pollution Prevention Plan,
maintenance performed, and actions taken. A copy of the inspection report shall be maintained on the job site.

END OF SECTION 015723
SECTION 016000 – MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. Standards: Refer to Section "Reference Standards and Definitions" for applicability of industry standards to products specified.

1. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section "Product Substitutions."

2. Since the Owner is a governmental entity or an organization which may be exempted from the sales and use taxes on certain tangible personal property, the Contractor shall be responsible for:

a. Determining whether such governmental entity or organization is exempt from such taxes under the Contract Documents.

b. Determining whether your purchase of any tangible personal property for use in the performance of this contract is exempt.

c. Obtaining any sales tax exemption certificate from the Owner.

d. Properly issuing any sales tax exemption certificate to a seller or supplier that the sale of any item of tangible personal property qualifies for an exemption. Maintaining any records required by the laws of the State of Texas or by any valid rules and/or regulations of the Comptroller of Public Accounts of the State of Texas. Payment of any legally assessed penalties or fines for improper use of any exemption Certificate.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

2. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

3. "Foreign Products", as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions; or produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of nor living within the United States and its possessions.

4. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

5. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.4 SUBMITTALS

A. Product List Schedule: Prepare a schedule showing products specified in a tabular form acceptable to the Architect. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.

1. Coordinate the product list schedule with the Contractor's Construction Schedule and the Schedule of Submittals.
B. Form: Prepare the product listing schedule with information on each item tabulated under the following column headings:

1. Related Specification Section number.
2. Generic name used in Contract Documents.
3. Proprietary name, model number and similar designations.
4. Manufacturer's name and address.
5. Supplier's name and address.
6. Installer's name and address.
7. Projected delivery date, or time span of delivery period.

C. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of an initial product list schedule. Provide a written explanation for omissions of data, and for known variations from Contract requirements.

1. At the Contractor's option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.

D. Completed Schedule: Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list schedule. Provide a written explanation for omissions of data, and for known variations from Contract requirements.

E. Architect's Action: The Architect will respond in writing to the Contractor within 2 weeks of receipt of the completed product list schedule. No response within this time period constitutes no objection to listed manufacturers or products, but does not constitute a waiver of the requirement that products comply with Contract Documents. The Architect's response will include the following:

1. A list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.5 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

1. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources that produce products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Foreign Product Limitations: Unless otherwise indicated, provide domestic products, not foreign products, for inclusion in the Work. At the sole discretion and approval of the Architect/Engineer, foreign products may be considered for inclusion in the Work only when all of the following conditions are met:

1. No available domestic product complies with the Contract Documents.
2. Domestic products that comply with Contract Documents are only available at prices or terms that are, in the opinion of the Architect/Engineer, substantially higher than prices or terms for foreign products that also comply with the Contract Documents.
3. The product is not expressly prohibited in other parts of the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

E. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

F. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

1. Name of product and manufacturer.
1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
2. Semiproprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
3. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
4. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning substitutions to obtain approval for use of an unnamed product.
5. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
6. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.

a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
7. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.

8. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

   a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning substitutions for selection of a matching product in another product category, or for noncompliance with specified requirements.

9. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

10. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection, and for procedures required for processing such selections.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

   A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

      1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 016000
SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1. Requirements of this Section also apply to mechanical and electrical installations, as well as Work specified in Divisions 2 through 33. Refer to Division 22, Division 23, and Division 26 Sections for other requirements and limitations applicable to cutting and patching plumbing, mechanical, and electrical installations.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform Work.
4. Indicate dates when cutting and patching is to be performed.
5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

   a. Foundation construction.
   b. Bearing and retaining walls.
   c. Structural concrete.
   d. Structural steel.
   e. Lintels.
   f. Structural decking.
   g. Miscellaneous structural metals.
   h. Equipment supports.
   i. Piping, ductwork, vessels and equipment.
   j. Structural systems of special construction in Division 13.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.
1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
   a. Shoring, bracing, and sheeting.
   b. Primary operational systems and equipment.
   c. Air or smoke barriers.
   d. Water, moisture, or vapor barriers.
   e. Membranes and flashings.
   f. Fire protection systems.
   g. Noise and vibration control elements and systems.
   h. Control systems.
   i. Communication systems.
   j. Conveying systems.
   k. Electrical wiring systems.
   l. Special construction specified by Division 13 Sections.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect’s opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1. If possible retain the original installer or fabricator to cut and patch the following categories of exposed Work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:
   b. Preformed metal panels.
   c. Window wall system.
   d. Acoustical ceilings.
   e. Finished wood flooring.
   f. Carpeting.
   g. Aggregate wall coating.
   h. Wall covering.
   i. HVAC enclosures, cabinets or covers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.
B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

   1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
   2. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

   1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

   1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
   3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
   4. Comply with requirements of applicable Sections of Division-2 where cutting and patching requires excavating and backfilling.
   5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

   1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
   2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
   3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.
   4. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat.
   5. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 017329
SECTION 017700 – PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures.
2. Project record document submittal.
3. Operating and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.
6. Demonstration and training videotapes.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 33.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request (exceptions on the first item below will not be allowed).

1. Prepare Operating and Maintenance Instructions and Manuals and Demonstration and Training Videotapes for the areas of the building changing possession at the time of Substantial Completion. Operating and Maintenance Instructions and Manuals and Demonstration and Training Videotapes must be given to the Owner prior to the issuance of the Certificate of Substantial Completion.
2. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documents for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
3. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
4. Advise Owner of pending insurance change-over requirements.
5. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
6. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
7. Submit record drawings, maintenance manuals, final project photographs, damage or settlement survey, property survey, and similar final record information.
8. Submit to Owner two copies of the Material Safety Data Sheet Manual.
9. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable. Extra materials include but are not necessarily limited to those listed in the “Summary of Extra Materials” following this Section.
10. Make final change-over of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of change-over in security provisions.
11. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested, and assured by the Contractor in writing, that the Work has been substantially completed.
2. Results of the completed inspection will form the basis of requirements for final acceptance.
1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.
5. Submit consent of surety to final payment.
6. Submit Notice of Termination as required in Division 1 Section “Erosion and Sediment Control”.
7. Submit a final liquidated damages settlement statement.
8. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
9. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Architect.

1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, reinspection will be repeated.
3. Should the Architect perform reinspections, due to failure of the Work to comply with the claims of status of completion made by the Contractor, the Owner shall compensate the Architect for additional services; and the Owner shall deduct the amount of the compensation from the final payment to the Contractor.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistant location; provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drafting is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with colored erasable pencil; use other colors to distinguish between variations in separate categories of the Work; use the following color code:
   b. Blue for Structural Work.
   c. Green for Plumbing Work.
   d. Orange for HVAC Work.
   e. Brown for Electrical Work.
   f. Black for other written notations.

2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
3. Note related Change Order numbers where applicable.
4. At completion of project, transfer all Project Record Data to one complete set of mylar sepias using mylar compatible colored pencils or ink. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set. Deliver one complete set of mylar sepias of all drawings to the Architect for the Owner's records. The cost of printing the mylar sepias shall be paid by the Contractor.
C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in the actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.

1. Upon completion of mark-up, submit complete set of record Product Data to the Architect for the Owner's records.

E. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted Samples have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect for the Owner's records.

G. Record Electronic Drawings: Comply with the following:

1. Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected Electronic Drawings of the Contract Drawings, as follows:

   a. Format: Portable Document Format (PDF), program, version, and operating system as the original Contract Drawings.
   b. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
   c. Refer instances of uncertainty to Architect for resolution.
   d. Organize electronic information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each electronic file.
   e. Identification: As follows:

      1.) Project name.
      2.) Date.
      3.) Designation "PROJECT RECORD DRAWINGS."
      4.) Name of Architect.
      5.) Name of Contractor.

   f. Number of Copies: Submit copies of Record Electronic Drawings as follows:

      1.) Submit two sets of Record Electronic Drawing electronic files, two sets of Record Electronic Drawing plots, and two copies printed from record plots. Plot and print each Drawing, whether or not changes and additional information were recorded. Contractor shall be responsible for all reproduction costs.
      2.) Electronic Media: CD-ROM.

   g. Upon completion of the Work, submit Record Electronic Drawing files, plots, and prints to the Architect for the Owner's records.

H. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2 inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
4. Wiring diagrams.
5. Recommended "turn around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.
8. Fixture lamping schedule.

I. Demonstration and Training Videotapes: Submit two copies of each videotape within seven days of recording.
   1. Identification: On each copy provide an applied label with the following information:
      a. Name of Project.
      b. Name and address of photographer.
      c. Name of Architect (and Construction Manager when applicable).
      d. Name of Contractor.
      e. Date videotape was recorded.
      f. Description of videotape content including description of subject building equipment and/ or systems,
         and general description of training or procedures covered.

PART 2 - PRODUCTS

2.1 CLEANING AGENTS

A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the
   surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that
   might damage finished surfaces.

2.2 VIDEO MEDIA

B. Videotape Format: Provide high-quality DVD.

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance
   to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not
   experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the
   following items:

   1. Maintenance manuals.
   2. Record documents.
   3. Spare parts and materials.
   4. Tools.
   5. Lubricants.
   6. Fuels.
   7. Identification systems.
   8. Control sequences.
   9. Hazards.
   10. Cleaning.
   11. Warranties and bonds.
   12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

   1. Start-up.
   2. Shut down.
   3. Emergency operations.
   5. Safety procedures.
7. Effective energy utilization.

C. Demonstration and Training Videotapes: Record instruction of Owner's personnel in the operation and maintenance of equipment and systems. Edit videotape to remove noninstructional conversation. Photographer shall select vantage points to best show equipment, systems, and procedures demonstrated.

1. Contractor may, with Owner's written approval and in compliance with other requirements, provide manufacturer's standard demonstration and training videotapes in lieu of on-site custom recorded videotape.

3.2 FINAL CLEANING

A. General: General cleaning during construction is required by the General Conditions and included in Section "Temporary Facilities".

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
2. Remove labels that are not permanent labels.
3. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
4. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
5. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
6. Clean the site, including landscape development areas, of rubbish, litter and foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

C. Pest Control: Engage an experienced exterminator to make a final inspection, and rid the Project of rodents, insects and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

3.3 REQUIRED CONTRACT CLOSEOUT DELIVERABLES

A. Contractor shall provide a spreadsheet list of the following required closeout documents identifying box, binder and tab location of each item. For overstock items delivered to Owner, Contractor shall provide original Letter of Transmittal signed by recipient.

**AIA DOCUMENTS:** originals NOT a copy.

- G702 – Application and Certificate for Payment. Submit final Application for Payment identifying total adjusted Contract sum, previous payments, and sum remaining due.
- G706 – Contractor’s Affidavit of Payment of Debts and Claims
- G706A – Contractor’s Affidavit of Release of Liens – Subcontractor’s Materials & Supplies
- G707 - Consent of Surety to Final Payment with Power of Attorney

**RECORD DRAWINGS:** One set on double sided 3 mil Mylar & CD-ROM of Drawings
- Architectural Plans
- Kitchen Plans
Landscaping Plans
Civil Plans
Structural Plans
HVAC & Plumbing Plans & Fire Sprinkler Plans
Controls Plans  
Electrical

OTHER HARD COPY DOCUMENTS
Testing and Balancing Report, including Water and Air reports.
Set of approved submittals with A/E comments.
Maintenance & Operation manuals on all equipment. Divisions 2-17.
A/E Specifications w/all addendum's & change orders (MS Word ) on CD-ROM. Project Manual(s)
Approved Shop Drawings
Completed Punch List verified by A/E and letter
Fire Alarm Certification/Completion Record

AFFIDAVITS & NOTARIZED DOCUMENTS
Asbestos free affidavit by Contractor on form
Asbestos free affidavit by Architect on letterhead
Short Term Worker/Contractor Asbestos Notification on form (Only for Remodel Projects)
  Warranties from General Contractor, Sub Contractor and Suppliers provide duplicated notarized copies. (Including 2 year and twenty year roof warranties, Siemens, and Cabling Warranty)

AGENCIES FORMS & DOCUMENTS
Original "Certificate of Occupancy" and/or "Letter from City"
TDLR "Closed with Compliance" letter. Plan review & inspection work sheets, this item by A/E
TEA: "Certification of Project Compliance" this item by A/E
Proof of TDLR Boiler and Elevator inspections.

OVERSTOCK ITEMS
Surplus materials and contract specified Overstock materials delivered to Maintenance (Paint, VCT, Ceiling Tiles, Fuses, etc.)
Overstock Keys, special tools as required by specifications.

* Final payment cannot be issued to the Contractor until all documents have been received & verified by the Architect & Owner.

** These documents are generated by the Contractor and are to be delivered to the Architect.
### CONTRACT CLOSEOUT DELIVERABLES *

<table>
<thead>
<tr>
<th>GENERAL CONTRACTOR - CLOSEOUT DELIVERABLES CHECKLIST:</th>
<th>LOCATION</th>
<th>COMPLETION DATE</th>
<th>COMMENTS</th>
</tr>
</thead>
</table>

#### FINANCIAL/AIA DOCUMENTS: (Originals)
- G702- Application and Certificate for Payment. Submit final Application for Payment identifying total adjusted Contract sum, previous payments, and sum remaining due.
- G706- Contractor's Affidavit of Payment of Debts and Claims (G.C. and each Sub.)
- G706A – Contractor's Affidavit of Release of Liens (G.C. and each Sub.)
- G707 – Consent of Surety to Final Payment with Power of Attorney

#### ADMINISTRATIVE: (Originals)
- Names, Addresses, Phone and Fax numbers of G.C. and Subs.
- Certificate of Occupancy
- Asbestos Free Affidavit
- Short Term Worker / Contractor Asbestos Notification Affidavit
- Punch Lists: Each Item Signed Off and Dated
- Warranties (G.C. and each Sub)
- Special Inspections Log

#### EXTENDED WARRANTIES: (Originals)
- Roof Installer Warranty - Two (2) years
- Roof Manufacturer’s Warranty – Twenty (20) years
- Metal Wall Panel Manufacturer’s Warranty – Twenty (20) years
- Solid Core Interior Doors Warranty – Life of Installation
- Door Closers Warranty – Ten (10) years
- Exist Devices Warranty – Five (5) years
- Lockset Warranty – Seven (7) years
- Aluminum Framed Storefront and Entrances – Assembly Warranty – Two (2) years
- Aluminum Framed Storefront and Entrances – Finish Warranty – Five (5) years
- Laminated Glass Warranty – Five (5) years

#### RECORD DRAWINGS: ***
- Original Set of Record Drawings (Posted Job Trailer Set)
- Original Set of Record Drawings printed on the back of 3 mil Mylar
- Original Set of Record Drawings in PDF Format on CD ROM **
- Irrigation Record Drawings ****
- HVAC Controls Record Drawings ****
- Fire Sprinkler Record Drawings ****
- Fire Alarm Record Drawings ****
- Intercom Record Drawings****
- Original Set of Specifications (Posted Job Trailer Set)

#### OPERATION AND MAINTENANCE MANUALS:
- Mechanical and Controls
Plumbing
Electrical
Special Systems (Security, Fire, Intercom, Technology)
Food Service Equipment

**OVERSTOCK ITEMS:**
Surplus Materials and Contract Specified Overstock Materials Delivered to Owner. (To include, but not limited to: Paint, VCT, Ceiling Tiles, Fuses, etc.)
Overstock keys
Signed Letter of Transmittal Indicating Delivery of Items to Owner.

**HARD COPY DOCUMENTS:**
Complete Set of Approved Submittals and Shop Drawings
Testing & Balancing Report, Including Water & Air Reports.
Fire Alarm Certification Report and Completion Record
Cabling Test Reports

**ARCHITECTURAL - CLOSEOUT DELIVERABLES CHECKLIST:**

**ADMINISTRATIVE:**
Asbestos Free Affidavit on Letterhead
Special Inspections Letter
Structural Letter
TEA "Certification of Project Compliance" Form
TDLR Plan Review Letter
TDLR "Closed with Compliance" Letter.

**DRAWINGS:**
Original Set of Construction Drawings in PDF Format on CD ROM**
Original Set of Specifications in PDF Format on CD ROM**
Addenda, Proposal Requests, Allowance Expenditure Authorizations, Change Orders, Construction Change Directives, in PDF Format on CD ROM. **

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* Final Payment cannot be issued to the contractor until documents have been received by the Owner, verified by the Architect
** Confirm with Owner software compatibility.
*** Partial retainage may be held until A/E Team has received record drawings.
**** These documents are generated by the Contractor and are to be delivered to the Architect.

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Owner Date

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Architect Date
## SUMMARY OF EXTRA MATERIALS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>REQUIREMENT</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>074293</td>
<td>METAL SOFFIT PANELS</td>
<td>Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Furnish full lengths of soffit in a quantity equal to 2 percent of amount installed.</td>
<td></td>
</tr>
<tr>
<td>074619</td>
<td>STEEL SIDING</td>
<td>Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Furnish full lengths of siding in a quantity equal to 2 percent of amount installed.</td>
<td></td>
</tr>
<tr>
<td>087100</td>
<td>DOOR HARDWARE</td>
<td>Furnish one extra blank key for each lock.</td>
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</tr>
<tr>
<td>093013</td>
<td>CERAMIC TILE</td>
<td>Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.</td>
<td></td>
</tr>
<tr>
<td>095113</td>
<td>ACOUSTICAL PANEL CEILINGS</td>
<td>Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.</td>
<td></td>
</tr>
<tr>
<td>095423</td>
<td>LINEAR METAL CEILINGS</td>
<td>Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Linear Metal Ceiling Units.: Full-size units equal to 2.0 percent of amount installed. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.</td>
<td></td>
</tr>
<tr>
<td>095423.13</td>
<td>METAL CEILING SYSTEMS</td>
<td>Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.</td>
<td></td>
</tr>
<tr>
<td>095436</td>
<td>SUSPENDED DECORATIVE GRIDS</td>
<td>Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Suspended Decorative Grids: Furnish quantity of full-size units equal to 5 percent of amount installed.</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Details</td>
<td></td>
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<td>------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>095453</td>
<td>FRP PANEL CEILINGS</td>
<td>Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels. FRP Panel Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0 percent of amount installed.</td>
<td></td>
</tr>
<tr>
<td>096513</td>
<td>RESILIENT WALL BASE AND ACCESSORIES</td>
<td>Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Furnish not less than 10 linear feet (3 linear m) for each 500 linear feet (150 linear m) or fraction thereof, of each different type, color, pattern, and size of resilient product installed. Deliver extra materials to Owner.</td>
<td></td>
</tr>
<tr>
<td>096513.33</td>
<td>METAL FLOORING ACCESSORIES</td>
<td>Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage, and identified with labels clearly describing contents. Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof of each different type and color of resilient wall base installed.</td>
<td></td>
</tr>
<tr>
<td>096513.33</td>
<td>METAL FLOORING ACCESSORIES</td>
<td>Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage, and identified with labels clearly describing contents. Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof of each different type and color of resilient wall base installed.</td>
<td></td>
</tr>
<tr>
<td>096519</td>
<td>RESILIENT FLOOR TILE</td>
<td>Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.</td>
<td></td>
</tr>
<tr>
<td>096816</td>
<td>CARPET</td>
<td>Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).</td>
<td></td>
</tr>
<tr>
<td>097200</td>
<td>WALL COVERINGS</td>
<td>Furnish extra materials described below, before installation begins, that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Rolls of Wall Covering Material: Full-size units equal to 5 percent of amount of each type installed.</td>
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</tr>
<tr>
<td>097723</td>
<td>ACOUSTICAL WALL PANELS</td>
<td>Deliver extra materials to Owner. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels: Acoustical Wall Panels: Furnish quantity of full size units equal to 2.0 percent of the amount installed.</td>
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<tr>
<td>Code</td>
<td>Description</td>
<td>Instructions</td>
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<td>------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>098433</td>
<td>DECORATIVE ACOUSTICAL WALL PANELS</td>
<td>Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Acoustical Wall Panels: Full-size units equal to 2 percent of amount installed.</td>
<td></td>
</tr>
<tr>
<td>099100</td>
<td>PAINTING (PROFESSIONAL LINE PRODUCTS)</td>
<td>Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner. Quantity: Furnish Owner with an additional 3 percent, but not less than 1 gal. (3.8 L) or 1 case, as appropriate, of each material and color applied.</td>
<td></td>
</tr>
<tr>
<td>099600</td>
<td>HIGH-PERFORMANCE COATINGS</td>
<td>Furnish extra high-performance coating materials from the same production run as materials applied and in quantities described below. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. (3.785 L) or 1 case, as appropriate, of each material and color applied.</td>
<td></td>
</tr>
<tr>
<td>099653</td>
<td>ELASTOMERIC COATINGS</td>
<td>Furnish extra elastomeric coating materials from the same production run as materials applied in quantities described below. Package materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. (3.8 L) or 1 case, as appropriate, of each color applied.</td>
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</tr>
<tr>
<td>101300</td>
<td>DIRECTORIES AND BULLETIN BOARDS</td>
<td>Deliver extra blank message strips to Owner. Furnish extra message strips that match message strips installed, are packaged with protective covering for storage, and are identified with labels describing contents. Message-Strip Units: Furnish blank, full-size, message-strip units equal to 10 percent of amount installed for Owner's future use.</td>
<td></td>
</tr>
<tr>
<td>105613</td>
<td>METAL STORAGE SHELVING</td>
<td>After completion of work, deliver not less than 2 of each type, color, and pattern of metal storage shelving, exclusive of material required to properly complete installation. Furnish 2% of accessory components as scheduled. Furnish replacement materials from same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels.</td>
<td></td>
</tr>
<tr>
<td>109100</td>
<td>PIPING COVER SYSTEM</td>
<td>Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Full-length units of each type in lengths for a total equal to 1.0 percent of total linear amount installed, of each type.</td>
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</tr>
<tr>
<td>122113</td>
<td>HORIZONTAL LOUVER BLINDS</td>
<td>Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Horizontal Louver Blinds: Before installation begins, for each size, color, texture, pattern, and gloss indicated, full-size units equal to 5 percent of amount installed.</td>
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<tr>
<td>Code</td>
<td>Description</td>
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<tr>
<td>123216.13</td>
<td>INSTITUTIONAL CASEWORK</td>
<td>Furnish complete touchup kit for each type and finish of institutional casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Five (5) each door hinges. Five (5) each door pulls. Five (5) each door catches.</td>
<td></td>
</tr>
<tr>
<td>124619</td>
<td>CLOCKS</td>
<td>Deliver extra materials to Owner. Furnish replacement materials described below from same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels. For each item indicated, furnish quantity of units equal to 5 percent of amount installed.</td>
<td></td>
</tr>
<tr>
<td>129300</td>
<td>OUTDOOR FURNISINGS</td>
<td>Deliver extra materials to Owner. Furnish replacement materials described below from same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels. For each item indicated, furnish quantity of units equal to 5 percent of amount installed.</td>
<td></td>
</tr>
<tr>
<td>142400</td>
<td>HYDRAULIC ELEVATORS</td>
<td>Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance service by skilled employees of the elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies as used in the manufacture and installation of original equipment. Perform maintenance, including emergency callback service, during normal working hours. Include 24-hour-per-day, 7-day-per-week emergency callback service. Response Time: Two hours or less. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.</td>
<td></td>
</tr>
</tbody>
</table>
SECTION 01 78 00 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.

2. General closeout requirements are included in Section "Project Closeout."

3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the individual Sections of Divisions-2 through -32.

4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

C. Separate Prime Contracts: Each prime Contractor is responsible for warranties related to its own Contract.

1.3 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

a. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
1.5 SUBMITTALS

A. **Submit written warranties** to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen days of completion of that designated portion of the Work.

2. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.

3. Forms for special warranties are included at the end of this Section. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or the Contractor and subcontractor, supplier or manufacturer. Submit a draft to the Owner through the Architect for approval prior to final execution.

   a. Refer to individual Sections of Divisions-2 through -16 for specific content requirements, and particular requirements for submittal of special warranties.

B. **Form of Submittal:** At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

   a. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

   b. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS, the Project title or name, and the name of the Contractor.

2. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION

3.1 SCHEDULE OF WARRANTIES

A. **Schedule:** Provide list of warranties and bonds on products and installations including, but not limited to, those specified in the TABLE OF WARRANTIES following this Section.
<table>
<thead>
<tr>
<th>SECTION NUMBER</th>
<th>SECTION TITLE</th>
<th>WARRANTY REQUIREMENT</th>
<th>WARRANTY PERIOD</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>02361</td>
<td>TERMITE CONTROL</td>
<td>General Warranty: Special warranty 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.</td>
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<td>Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.</td>
<td>Five (5) years from date of Substantial Completion</td>
<td></td>
</tr>
<tr>
<td>07412</td>
<td>MANUFACTURED WALL</td>
<td>General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.</td>
<td></td>
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<tr>
<td></td>
<td>PANELS</td>
<td>Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal wall panels within the specified warranty period and agreeing to repair finish or replace wall panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.</td>
<td>Finish Warranty Period: Twenty (20) years from date of Substantial Completion</td>
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<tr>
<td></td>
<td></td>
<td>Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal wall panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.</td>
<td>(20) years from date of Substantial Completion</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Section Description</td>
<td>Warranty Details</td>
<td></td>
<td></td>
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<tr>
<td>07461</td>
<td><strong>METAL SOFFITS</strong></td>
<td>General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.</td>
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<td></td>
</tr>
<tr>
<td>07520</td>
<td><strong>MODIFIED ASPHALT BITUMINOUS ROOFING</strong></td>
<td>Special Project Warranty: Submit a written warranty, executed by soffit manufacturer, agreeing to repair or replace soffit that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, cracking, deforming, fading, or otherwise deteriorating beyond normal weathering. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 4 color-difference units as measured according to ASTM D 2244. Twenty (20) years from date of Substantial Completion.</td>
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</tr>
<tr>
<td>07716</td>
<td><strong>ROOF EXPANSION ASSEMBLIES</strong></td>
<td>General Warranty: Special warranty 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.</td>
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<tr>
<td>Description</td>
<td>Details</td>
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<tr>
<td>Special Warranty</td>
<td>Written warranty, signed by roof expansion assembly manufacturer and Installer agreeing to repair or replace roof expansion assemblies that leak, deteriorate in excess of rates specified in manufacturer's published product literature, or otherwise fail to perform within specified warranty period. Two (2) years from date of Substantial Completion</td>
<td></td>
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</tr>
<tr>
<td>ROOF-TOP EQUIPMENT SUPPORTS</td>
<td>Submit manufacturer's warranty that base materials will perform without failure and for the purpose intended for the same period as roofing warranty required under Division 7 roofing section.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>SPRAYED FIRE-RESISTIVE MATERIALS</td>
<td>Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace sprayed fire-resistant materials that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following: Two (2) years from date of Substantial Completion</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>JOINT SEALERS</td>
<td>General Warranty: 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. Two (2) years from date of Substantial Completion</td>
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<tr>
<td><strong>07730</strong></td>
<td><strong>07811</strong></td>
<td><strong>07900</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of sprayed fire-resistant materials from substrates.</td>
<td>*Not covered under the warranty are failures due to damage by occupants and Owner’s maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.</td>
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<td></td>
<td>Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period. Two (2) years from date of Substantial Completion</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Special Manufacturer's Warranty:

Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

- Twenty (20) years from date of Substantial Completion

### Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

- Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
- Disintegration of joint substrates from natural causes exceeding design specifications.
- Mechanical damage caused by individuals, tools, or other outside agents.
- Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

### FLUSH WOOD DOORS

**Special Warranty:** Manufacturer’s standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span.

- Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
<table>
<thead>
<tr>
<th><strong>Elementary School/Cole High School</strong></th>
<th><strong>SHW Group Project Nos.: 4512.013.00/ 4512.014.00</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renovations and Addition</strong></td>
<td><strong>June 25, 2014</strong></td>
</tr>
<tr>
<td><strong>Ft. Sam Houston ISD</strong></td>
<td><strong>WARRANTIES AND BONDS 01 78 00 - Page 7 of 10</strong></td>
</tr>
<tr>
<td>**©2013 SHW Group Architects</td>
<td>Engineers</td>
</tr>
</tbody>
</table>

| **Warranty shall be in effect during the following period of time from date of Substantial Completion:** |
| Solid-Core Interior Doors: | Life of installation |

| 08411 | **ALUMINUM FRAMED ENTRANCES AND STOREFRONTS** |
| Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period. | Two (2) years from date of Substantial Completion |

| Failures include, but are not limited to, the following: |
| *Structural failures including, but not limited to, excessive deflection. |
| *Noise or vibration caused by thermal movements. |
| *Deterioration of metals and other materials beyond normal weathering. |
| *Adhesive or cohesive sealant failures. |
| *Water leakage through fixed glazing and framing areas. |
| *Failure of operating components to function properly. |

| Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering. | Twenty (20) years from date of Substantial Completion |

| 08800 | **GLASS AND GLAZING** |
| General Warranty: 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. | |

<p>| Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer | Ten (10) years from date of Substantial Completion |</p>
<table>
<thead>
<tr>
<th>Agreement</th>
<th>Description</th>
<th>Warranty Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coated-glass</td>
<td>agreeing to replace coated-glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated.</td>
<td>Five (5) years from date of Substantial Completion</td>
</tr>
<tr>
<td>Laminated Glass</td>
<td>Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated.</td>
<td>Ten (10) years from date of Substantial Completion</td>
</tr>
<tr>
<td>Insulating Glass</td>
<td>Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period.</td>
<td>Five (5) years from date of manufacture</td>
</tr>
<tr>
<td>Mirrored Glass</td>
<td>General Warranty: Special warranty 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.</td>
<td>Five (5) years from date of manufacture</td>
</tr>
<tr>
<td>Silvered Mirrored Glass</td>
<td>Manufacturer's Special Warranty for Silvered Mirrored Glass: Written warranty, made out to Owner and signed by mirrored glass manufacturer agreeing to replace silvered mirrored glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated:</td>
<td>Five (5) years from date of manufacture</td>
</tr>
<tr>
<td>Carpet</td>
<td>General Warranty: Special warranty 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.</td>
<td>Five (5) years from date of manufacture</td>
</tr>
<tr>
<td>09963</td>
<td>ELASTOMERIC COATINGS</td>
<td>Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.</td>
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</tr>
<tr>
<td>10100</td>
<td>VISUAL DISPLAY BOARDS</td>
<td>General Warranty: The special porcelain enamel chalkboard and markerboard warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>Elastomeric Coating Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace elastomeric coatings that fail within the specified warranty period. Failures include, but are not limited to, water penetration through the coating.</td>
</tr>
<tr>
<td>---</td>
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<td>Porcelain Enamel Chalkboard and Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel chalkboards and markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.</td>
</tr>
<tr>
<td>10800</td>
<td>TOILET AND BATH ACCESSORIES</td>
<td>Special Project Warranty: Provide manufacturer's written 5 year warranty against silver spoilage of mirrors, agreeing to replace any mirrors that develop visible defects within warranty period.</td>
</tr>
</tbody>
</table>

END OF SECTION 01 78 00
SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section requires the selective removal and subsequent offsite disposal of the following:

1. Portions of existing building indicated on drawings and as required to accommodate new construction.
2. Removal of interior partitions as indicated on drawings.
3. Removal of doors and frames indicated "remove."
4. Removal of built-in casework indicated "remove."
5. Removal and protection of existing fixtures, materials, and equipment items indicated to be re-used.

B. Removal work specified elsewhere:

1. Cutting nonstructural concrete floors and masonry walls for piping, ducts, and conduits is included with the work of the respective mechanical and electrical specification sections in Divisions 22, 23, and 26.
2. Cutting holes in roof deck for installation of new rooftop mechanical equipment is specified in Division 23.

C. Related work specified elsewhere:

1. Remodeling construction work and patching are included within the respective Sections of specifications, including removal of materials for reuse and incorporation into remodeling or new construction.
2. Relocation of pipes, conduits, ducts, and other mechanical and electrical work is specified in other Divisions.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Schedule indicating proposed sequence of operations for Selective Demolition Work to Owner's Representative for review prior to start of Work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.

1. Provide detailed sequence of demolition and removal Work to ensure uninterrupted progress of Owner's on-site operations.
2. Coordinate with Owner's continuing occupation of portions of existing building and with Owner's partial occupancy of completed new addition.

C. Shoring Submittal: Include structural analysis data and drawings signed, dated and sealed by the qualified professional engineer responsible for their preparation. The Engineer shall be licensed in the state where the Work resides. The submittal to the Architect/Engineer is for their "records".

D. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Owner's Representative prior to start of Work.
1.5 JOB CONDITIONS

A. Occupancy: Owner will occupy portions of the building immediately adjacent to areas of Selective Demolition. Conduct Selective Demolition Work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities that will affect Owner's normal operations.

B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

   1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of Selective Demolition Work.

C. Partial Demolition and Removal: Owner maintains first right of salvage. Items indicated to be removed but of salvageable value to Contractor, and not required to be salvaged for Owner, may be removed from structure as Work progresses. Transport salvaged items from site as they are removed.

   1. Storage or sale of removed items on site will not be permitted.

D. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to Selective Demolition Work.

   1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to occupied portions of building.
   2. Erect temporary covered passageways as required by authorities having jurisdiction.
   3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or Work to remain. Responsibility for all aspects of shoring, in concept and in execution, shall reside with the Contractor doing the Work.
   4. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
   5. Protect floors with suitable coverings when necessary.
   6. Construct temporary insulated dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks.
   7. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
   8. Remove protections at completion of Work.

E. Damages: Promptly repair damages caused to adjacent facilities by Selective Demolition Work.

F. Traffic: Conduct Selective Demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

   1. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

G. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.

H. Explosives: Use of explosives will not be permitted.

I. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

   1. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
   2. Maintain fire protection services during Selective Demolition operations.

J. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.

   1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
PART 2 - PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

3.1 PREPARATION

A. General: Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.

1. Cease operations and notify Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
2. Cover and protect furniture, equipment, and fixtures from soilage or damage when Selective Demolition Work is performed in areas where such items have not been removed.
3. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.
   a. Where Selective Demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 4 inch studs, 5/8 inch drywall (joints taped) on occupied side, 1/2 inch fire-retardant plywood on demolition side. Fill partition cavity with sound-deadening insulation.
   b. Provide weatherproof closures for exterior openings resulting from Selective Demolition Work.
4. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.
   a. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building.
   b. Provide minimum of 72 hours advance notice to Owner if shutdown of service is necessary during changeover.

3.2 DEMOLITION

A. General: Perform Selective Demolition Work in a systematic manner. Use such methods as required to complete Work indicated on Drawings in accordance with demolition schedule and governing regulations. Do not proceed with Selective Demolition Work where shoring is required, until engineering analysis, drawings and reports have been completed and submitted to Architect/Engineer.

1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.
3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
4. Demolish foundation walls to a depth of not less than 12 inches below existing ground surface. Demolish and remove below-grade wood or metal construction. Break up below-grade concrete slabs.
5. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
6. Completely fill below-grade areas and voids resulting from Selective Demolition Work. Provide fill consisting of approved earth, gravel, or sand, free of trash and debris, stones over 6 inches in diameter, roots, or other organic matter.

B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative, rearrange Selective Demolition schedule as necessary to continue overall job progress without undue delay.

3.3 SALVAGED MATERIALS

A. Salvaged Items: Owner maintains first right of salvage. When directed by Architect or Owner, carefully remove indicated items, clean, store, and turn over to Owner and obtain receipt.
3.4 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from building site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose off site.

1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
2. Burning of removed materials is not permitted on project site.

3.5 CLEANUP AND REPAIR

A. General: Upon completion of Selective Demolition Work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.

1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by Selective Demolition Work.

END OF SECTION 024119
SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
5. Enclosures.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

C. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager no fewer than five days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Construction Manager's written permission.
4. Comply with NFPA 70E.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240-V or 600-V ac as required, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240-V or 600-V ac as required, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.


D. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
   1. Instantaneous trip.
   2. Long- and short-time pickup levels.
   3. Long- and short-time time adjustments.
   4. Ground-fault pickup level, time delay, and \( I^2t \) response.

E. Features and Accessories:
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
   3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
5. The external operating mechanism shall be provided, from the factory, with the capability of locking the electrical contacts in the open position. The locking mechanism shall be key operated.

2.4 MOLDED-CASE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Square D; a brand of Schneider Electric.

B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

C. Features and Accessories:

1. Standard frame sizes and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. The external operating mechanism shall be provided, from the factory, with the capability of locking the electrical contacts in the open position. The locking mechanism shall be key operated.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.
3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study".

END OF SECTION 26 2816
SECTION 03 1000 - CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

A. The Drawings and General Provisions of the contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to work specified in this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Furnish labor, materials, services, equipment, and appliances required in conjunction with design, fabrication and erection of formwork for cast-in-place concrete complete including but not limited to the following:
   1. Wood forms.
   2. Pan forms.
   3. Permanent metal forms.
   4. Cardboard carton forms (void boxes).
   5. Shores and reshoring.
   6. Installation in formwork of items furnished by other trades.
   7. Construction joint bulkheads, keys, blockouts, and sleeves.

B. Extent of formwork is indicated by cast-in-place concrete structures shown on Drawings.

C. Related Work Specified in Other Sections:
   1. Forms for sitework concrete: Division 3.
   2. Forms for precast concrete: Division 3.

1.3 QUALITY ASSURANCE

A. Latest adopted edition of all standards referenced in this Section shall apply, unless noted otherwise. In case of conflict between Contract Documents and a referenced standard, Contract Documents shall govern. In case of conflict between Contract Documents and Building Code, the more stringent shall govern.

B. Referenced Standards: American Concrete Institute (ACI); "Recommended Practice for Concrete Formwork," (ACI 347), and SP-4 "Formwork for Concrete."

C. Design of Forms and Falsework: Forms, shores, reshores, falsework, bracing, and other temporary supports shall be engineered by Contractor to support all imposed construction loads, including weight of construction equipment, allowance for live loads, lateral forces due to wind, and temporary imbalance or discontinuity of building components. Contractor is also responsible for determining when temporary supports and bracing may be safely removed, but in no case shall curing time before form removal be less than specified herein.

D. Provide formwork for mock-up or sample panels.

E. Construct Formwork to Provide Completed Cast-in-place Concrete Surfaces Complying with Tolerances as Follows:
   1. Variations from plumb in lines and surfaces of columns, and walls: 1/4" in any 10'-0" of length, but not more than 1" total for entire height. Exposed corner columns, control-joint grooves, and other conspicuous lines: 1/4" in any 20'-0" of length; 1/2" maximum for entire height.
   2. Variations from level or grade in slab soffits, ceilings, and beam soffits, measured before removal of supporting shores: 1/4" in any 10'-0" of length; 3/8" in any 20'-0" of length; and 3/4" maximum for entire length of structure. For exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines: 1/4" in any bay or any 20'-0" of length; and 1/2" maximum for entire length of structure.
3. Variations of distance between walls, columns, partitions, and beams: 1/4" per 10'-0" of distance, but not more than 1/2" in any one bay; and not more than 1" total variation.

4. Variation from position of linear building lines, such as slab edges and recess lines, from established position in plans: 1/2" in any one bay, not more than 1" on entire structure.

5. Variation in sizes of sleeves, floor openings, and wall openings: Minus 1/4" to plus 1/2". Variation in location: 1/2".

6. Variation in cross sectional dimensions of columns and beams and thickness of slabs and walls: Minus 1/4" to plus 1/2".

7. Variation in footing plan dimensions: Minus 1/2" to plus 2"; misplacement or eccentricity: 2% of footing width in direction of misplacement, but not more than 2"; thickness reduction: minus 5% of thickness.

8. Variation in steps in a flight of stairs: 1/8" for risers and 1/4" for treads.

9. Forming irregularities (within a 5 foot distance in any direction):
   a. Class A - Architecturally exposed surfaces and exposed surfaces in generally finished spaces: 1/8", either gradual or abrupt.
   b. Class B - Surfaces receiving plaster or stucco: 1/4", either gradual or abrupt.
   c. Class C - Exposed surfaces in generally unfinished spaces: 1/2", either gradual or abrupt.
   d. Class D - Concealed surfaces, unless other tolerances govern: 1", either gradual or abrupt.

10. Checking formwork:
    a. Before concrete placement check lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems.
    b. During concrete placement check formwork and related supports to ensure forms are not displaced and completed work will be within specified tolerances.
    c. Engage a licensed surveyor to verify work is within specified tolerances. Surveyor shall report in writing to Architect, with copy to Contractor, certifying work as acceptable or indicating deviations from allowable tolerances.

11. Combined tolerances for formwork, reinforcing fabrication and reinforcing placement shall not permit a reduction in specified concrete cover of reinforcing steel.

1.4 SUBMITTALS

   A. Product Data: Submit manufacturers' data and installation instructions for proprietary materials used in exposed concrete work including form liners, release agents, manufactured form systems, ties, and accessories.

   B. Shop Drawings:
   1. Submit for fabrication and erection of forms for concrete surfaces exposed to view. Show general construction of forms including jointing and special formed joints or reveals, location, pattern of form tie placement and other items affecting exposed concrete visually. Include details of inserts and anchorages.
   2. Architect's review will be for general architectural implications and features only. Formwork design for structural stability and sufficiency is Contractor's responsibility.
   3. In addition to the above, submit shop drawings detailing the following:
      a. Pan type forms.
      b. Submit manufacturer's product specifications for carton forms, retainers and related accessories.

   C. Documentation for LEED Credit MR 4.1 and Credit MR 4.2: For products having recycled content. Indicate percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

   D. Documentation for LEED Credit MR 5.1 and Credit MR 5.2: For products that are extracted, harvested or recovered and manufactured from within 500 miles of Project. Indicate location and distance from Project of material manufacturer and point of extraction, harvest, or
recovery for each raw or recycled material. Include statement indicating costs for each product that is regionally extracted, harvested or recovered and manufactured.

E. Documentation for LEED Credit EQ 4.1 and 4.2: Paints, coatings, adhesives, sealants, stains, caulk, firestopping, etc. **((inside the weatherproofing systems and))** applied on site only in this specification must comply with the VOC limits in Section **((01352))**. Include product data sheet or MSDS clearly showing VOC content of product in grams/Liter.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle form materials in conformance with manufacturers' printed instructions. Store materials subject to damage by elements, under cover and off ground.

1.6 JOB CONDITIONS

A. Coordinate formwork with work of other trades. Give other trades ample lead time for installation of their work.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to Compliance with Requirements, Manufacturers Offering Products Which May Be Incorporated in Work Include, but Are Not Limited To, the Following:

1. Laminated column forms:
   a. Jefferson Smurfit Corp.
   b. Sonoco Products Co.
   c. Consolidated Papers, Inc.

2. Fiberglass column forms:
   a. Ceco Corp.
   b. Molded Fiberglass Concrete Forms.
   c. Symons Corp.

3. Textured form liners:
   a. Doron Plastics Co.
   b. Scofield Construction Specialties.
   c. Scott System.
   d. Symons Corp.

4. Pan forms:
   a. Ceco Corp. (steel and plastic).
   b. Molded Fiberglass Concrete Forms (plastic).
   c. Symons Corp. (plastic).
   d. Doron Plastics Co. (plastic).
   e. Commercial Forms, Inc.

5. Formwork and accessories:
   a. Burke Co.
   b. Gates and Sons.
   c. Hohmann and Barnard, Inc.
   d. Dayton Superior Corp.
   e. Williams Form Engineering Corp.
   f. Symons Corp.

6. Cardboard carton forms: VoidForm Products, Inc.

2.2 FORM MATERIALS

A. All products shall be extracted, harvested or recovered and manufactured from within 500 miles of Project. All reinforcing bar and steel components shall contain minimum 95% recycled content, all raw materials shall be manufactured and extracted within 500 miles of
Project site and all recycled materials shall be manufactured and recovered within 500 miles of the Project site.

B. Forms for Exposed Finish Concrete:

1. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood-faced panels or other panel-type materials designed to provide continuous straight and smooth as-cast surfaces. Furnish in largest sizes to minimize number of joints and to conform to a regular joint pattern. Provide form material with sufficient thickness to withstand pressure of placed concrete without bow or deflection beyond allowable tolerances. Joints shall be made tight and strongly backed so edges of adjoining formwork will remain flush and true. Unsightly joint marks will not be permitted. Form joints shall be vertical or horizontal, unless otherwise noted.

2. Wood forms for exposed concrete surfaces shall be constructed of 3/4" thick finish plywood (4'-0" wide by 8'-0" long), complying with U.S. Product Standard PS 1-83, A-C or B-B High Density Overlay Concrete Form Panels, Class I, Exterior Type. Panels shall be mill-oiled and edge sealed, with each piece bearing DFPA inspection trademark. Contractor may use forms built of other materials at his option, with linings of one of the following types:
   a. Plywood: A-C Grade or better Douglas Fir concrete form, exterior 3 ply, not less than 1/4" thick, having one smooth face and bearing DFPA inspection trademark.
   b. Fiberboard: Treated, hard pressed fiberboard having a low degree of water absorptivity, not less than 3/16" thick, with one smooth side.

3. Forms for architecturally exposed surfaces shall be constructed of one of the following:
   b. Plastic faced plywood: Exterior grade Douglas Fir plywood, 3/4" thick, faced with high density polyethylene or PVC sheet, minimum 0.10" thickness. All edges shall be sealed.
   c. Steel: Fabricated by an experienced manufacturer and approved by Architect. Forms shall be 3/16" thick, smooth blue mill plate steel (no red steel shall be used which comes in contact with architectural concrete surfaces) with ribbing spaced a maximum of 1'-0" center-to-center. Forms shall be welded and cambered for deflection. All butt joints shall be welded full and ground flush with skin plate.
   d. Fiberglass with structural backing molded to shapes required, by an experienced manufacturer approved by Architect.

4. Forms for textured finish concrete: Provide special forming materials to produce surfaces with face design, arrangement, and configuration as shown on drawings or as required to meet Architect's control sample. Provide solid backing and form supports to ensure stability of textured form liners.

5. Rustications and bevels in exposed concrete shown on Drawings shall be formed with steel, polyvinyl chloride or milled and sealed white pine.

6. Cylindrical forms: Form round section members with paper or fiber tubes, fabricated steel forms, or molded fiberglass.
   a. Paper or fiber tubes shall be constructed of laminated plies, using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection and plastic lined interior. Units shall have sufficient wall thickness to resist loads imposed by wet concrete without deformation. Tubes shall be furnished full length without splices.
      1) Provide manufacturer's standard plastic-lined interior units.
      2) Provide units having "seamless" interior to minimize spiral gaps or seams.
   b. Manufactured steel and fiberglass forms shall be of sufficient thickness to prevent bulges and warps. Butt sections together with bolted or keyed joints.
Concrete Forming and Accessories

Forms shall be new or reconditioned, free of bends, warps, tears, holes, and dents.

c. Forms shall be one-piece, full-height sections with 1 or 2 vertical joints. Finish joints so there are no visible joint marks left on concrete.

C. Forms for Unexposed Concrete Surfaces:
1. Form with plywood, lumber, metal, or other acceptable material. Use lumber dressed on at least two edges and one side for tight fit.
2. Wood forms shall be of No. 2 Common Southern Yellow Pine lumber, 1½" minimum, commercial standard Douglas fir form plywood, or other material of equal qualifications, of sufficient thickness to sustain loads imposed thereon, dressed to uniformly smooth contact surfaces, and constructed to be readily removable.
3. Provide adequate shores in crawlspaces, supported on mud pads seated firmly in the subgrade. Prepare subgrade as required to prevent settlement of formwork.

D. Pan Forms: Provide new or reconditioned forms for concrete pan-type construction, complete with fillers and end enclosures. Design units for easy removal without damaging placed concrete. Block adjoining pan units, if required, to avoid lateral deflection of formwork during concrete placement and compaction. Provide standard or tapered end forms, as shown. Pan forms shall be factory fabricated pan form units or a combination of two such standard units with a filler strip, to obtain pan sizes shown on Drawings. Pans and fillers shall be well maintained, with adequate strength, stiffness, and connections to obtain concrete surfaces within specified tolerances. Pans shall be of the following materials:
1. Steel, free of dents, irregularities, sag, and rust. Wide pans shall have welded intermediate stiffeners to limit sag between joists.

E. Pan forms in areas permanently exposed to view shall be one-piece units, cut to length between beams or distribution ribs, or segmented forms with reinforced butt-joint splices. Lap splices and wood formed soffit gaps will not be acceptable. Treat longitudinal soffit joints with chamfer strips as indicated on architectural drawings. Metal pans shall have welded end caps.

F. Carton Forms (Void Boxes): Shall be pre-manufactured corrugated paper cartons, as manufactured by VoidForm Products, Inc., Englewood, Co. Exterior surface of void box forms shall be moisture-resistant (wax coated). Forms shall have interior cross walls forming a uniform cellular configuration. Carton forms shall be manufactured from medium wax impregnated paper using waterproof adhesive. Interior liners of corrugated paper shall have no wax.
1. Slabs: Use "Regular" strength "SlabVoid" with interior cell sizes 8" x 8" or smaller, capable of sustaining a working load of 1000 psf, for slabs 12" thick or less. For slabs thicker than 12", a higher working load is required. Contact the structural engineer for requirements.
2. Grade beams and walls: Rectangular shape as shown on details. Provide end caps at end of forms and corners. Provide premanufactured curve-ended units, "ArcVoid" or “SureRound PierVoid", against tops of drilled piers for tight fit. Cartons shall be capable of sustaining a working load of 200 PSF times the height of pour, in feet, without significant deformation.
3. Piers: At interior piers supporting slab over carton forms, use “SureRound Pier Void” or approved equal to provide tight fit around pier.

G. Protection Board: Used over carton forms under slabs and under grade beams or walls wider than 12". Board shall be hot-pressed cellulose fiber hardboard equal to Masonite, 3/16" minimum thickness, furnished in 4'-0" x 8'-0" sheets.

H. Soil Retainers: Precast concrete or hadite squares of sufficient thickness to withstand installation and compaction forces, or “SureRetainer” by Motzblock, VoidForm Products, Inc.
I. **Corrugated Steel Forms (Permanent Metal Forms):** Fabricate out of ((galvanized or uncoated)) steel sheets, complying with AISC "Specification for the Design of Cold-Formed Steel Structural Members."

Depth of ribs and metal gauge shall be designed by manufacturer to fit span and load conditions. Deflection shall be limited to 1/240 of span when subjected to wet concrete weight and an additional construction load of 20 psf.

Deck material, gauge and rib pattern shall be as noted on Drawings.

J. **Form Ducts:** For dowels and grout with corrugated galvanized rigid metal conduit, minimum 28 gauge, sizes shown on Drawing. Metal conduit shall be able to resist pressure of wet concrete without deforming or leaking.

K. **Form Ties:** Provide factory-fabricated, adjustable length, removable or snap-off metal form ties, designed to prevent deflection, and to prevent spalling concrete surfaces upon removal. Unless otherwise shown, provide ties designed to break off at least 1" from outer concrete surface, or to be fully removable leaving a hole not larger than 1" diameter in concrete surface.

L. **Form Release Agent:** Provide a commercially formulated release agent that will not bond with, stain, nor adversely affect concrete surfaces; will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds.

Form release agent shall contain no petroleum solvents such as creosote or diesel oil.

Form Release Agent: Provide a commercially formulated non-toxic, bio-based, bio-degradable release agent that will not bond with, stain, nor adversely affect concrete surfaces; will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds. Volatile organic compound (VOC) content shall not exceed 50 g/l.

M. **Powder Actuated Fasteners:** Shall have a nominal 9/64" shank diameter and a 1 1/4" shank length. Acceptable manufacturers are Hilti Fastening Systems, Tulsa, Ok.; Ramset Fastening Systems, East Alton, Ill.; and ITT Phillips Drill Division, Michigan City, Ind.

N. **Reglets:** Provide sheet metal reglets formed of same type and gauge as flashing metal, unless otherwise indicated. Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 26 gauge galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

O. **Penetrations:** Unless otherwise indicated, sleeves and blockouts may be formed with galvanized metal, galvanized pipe, PVC pipe, fiber tubes, or wood, sized to hold shape during concrete placement.

2.3 **DESIGN OF FORMWORK**

A. Design and engineering of formwork, as well as its construction, is responsibility of Contractor. Concrete members shall be adequately shored to safely support all loads and lateral pressures outlined in "Recommended Practice for Concrete Formwork" (ACI 347) without distortion, excessive deflection or other damage. Necessary forms, centering, shores and molds shall be built to conform to shapes, lines and dimensions of various members of concrete construction, as shown or scheduled on Drawings. They shall be sufficiently tight and so substantially assembled as to prevent bulging, or leakage of cement paste. All forms shall be assembled to facilitate their removal without damage to concrete. Construct forms with such care as to produce concrete surfaces which will not leave unsightly or objectionable form marks in exposed concrete surfaces. Lumber once used as forms shall have all contact surfaces thoroughly cleaned before reuse.
B. Design, erect, support, brace, and maintain formwork to safely support vertical and lateral loads that might be applied, until such loads can be supported by concrete structure. Carry vertical and lateral loads to the ground by formwork system and in-place construction that has attained adequate strength for that purpose.

C. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.

D. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

E. Fabricate formwork to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required, to prevent leakage and fins.

PART 3 EXECUTION

3.1 FORM CONSTRUCTION

A. General: Construct forms to sizes, shapes, lines, and dimensions shown and as required to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required. Use selected materials to obtain required finishes.

B. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete. Kerf wood inserts for forming keyways, reglets, recesses, etc., to prevent swelling and assure ease of removal.

C. Provide temporary openings in bottom of all walls, deep grade beams, and other locations where interior area of formwork is inaccessible for cleanout or inspection before concrete placement, and for placement of concrete. Brace temporary closures and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms in as inconspicuous location as possible, consistent with project requirements.

D. Support form facing materials by structural members, spaced sufficiently close to prevent deflection. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances.
   1. Construct forms to cambers shown or specified to allow for structural deflection of hardened concrete.
   2. Provide additional elevation or camber in formwork as required for anticipated formwork deflections due to weight and pressures of fresh concrete and construction loads. Make adjustments to allow for closure of form joints, settlement of mud sills, shrinkage of lumber, dead load deflections, and elastic shortening of form members.
   3. Carefully inspect falsework and formwork during and after concrete placement operations, to determine abnormal deflection or signs of failure; make necessary adjustments to produce work of required dimension.

E. Form intersecting planes to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete.

F. Place corrugated steel forms with ribs perpendicular to supports and secure as noted on general notes.

G. Falsework: Erect, support, brace, and maintain it to safely support vertical, lateral and asymmetrical loads applied until such loads can be supported by in-place concrete structures.
H. Provide shores and struts with positive means of adjustment, capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.

I. Forms for Exposed Concrete: Drill forms from contact face to outside, to suit ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared holes.
   1. Do not use metal cover plates for patching holes or defects in forms.
   2. Provide sharp, clean corners at intersecting planes without visible edges or offsets.
      Back joints with extra studs or girts to maintain true, square intersections. Form joints shall be vertical and horizontal unless otherwise requested and approved by Architect.
   3. Use extra studs, walers, and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips which will produce bow for form material.
   4. Assemble forms so they may be readily removed without damage to exposed concrete surfaces.
   5. Form molding shapes, recesses and projections with smooth-finish materials, and install in forms with sealed joints to prevent displacement.
   6. Locate form ties in level horizontal rows, plumbed vertically, and in symmetrical arrangement with openings, unless otherwise noted.

J. Forms for Architectural Concrete:
   1. Construct and prepare forms to produce units conforming to specified tolerances and finishes free of bulges, objectionable marks, and discolorations; conforming to shapes, lines, and dimensions shown on Drawings.
   2. All joints, gaps, and apertures in forms, wherever located, shall be gasketed, plugged and/or caulked with a suitable material so they will withstand pressure and will remain watertight.
   3. Forms shall be thoroughly cleaned, reconditioned and recoated with a non-staining form release agent prior to each use.
   4. Form joints shall be flush, watertight and properly treated. Use non-absorbent type gaskets applied with waterproof adhesive and/or rubberized caulkling. Corner joints shall be gasketed with closed-cell neoprene, applied with waterproof adhesive. Butt joint edges of Finn Form shall be spaced 3/16” apart and shall be staggered at least 1” from structural plywood backup joints. Prime and fill gaps with silicone caulk, equal to clear G. E. Silicone caulkng compound. Contractor may request, and if approved in writing by Architect, use plastic treated tape affixed with waterproof adhesive for unusual joint conditions. Tape shall be placed on formwork prior to application of release agent and shall not be applied more than 24 hours prior to casting concrete. Release agent shall be removed from any treated areas where tape is to be applied with a suitable solvent prior to affixing tape. ABS plastic liner joints shall be equally formed with watertight joints.
   5. Construction joints requiring rustication, unless otherwise noted, shall have rustication placed in first casting. All loose concrete dust and other fine materials shall be removed from surface prior to erection of forms. Formwork for succeeding lift shall be held tight against top of previous lift and positively gasketed at rustication to prevent grout or paste leakage.
   6. All other construction joints (horizontal and vertical) without rustications shall be cast with first casting scalloped, to allow coarse aggregate to interlock with second casting. Form for first casting shall be completely removed prior to scalloping, and form for second casting shall not be installed until after scalloping is completed. Scalloping may be produced by abrasive blasting within 24 hours, with a fine sharp blasting sand or by brushing and exposing aggregate prior to final set. Form work for succeeding lift shall be held tight against the top of previous lift and positively gasketed and caulked to prevent leakage.
K. Corner Treatment: Form exposed corners of beams, walls and columns to produce chamfered, smooth, solid, unbroken lines, except as otherwise indicated.
   1. Form chamfers with 3/4" X 3/4" strips, unless otherwise indicated, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer at changes in direction.
   2. Unexposed corners may be formed either square or chamfered.

L. Control Joints: See "Cast-in-place Concrete" Section for treatment of control and construction joints including wood screeds, metal keyways and sawcuts. Locate as indicated.

M. Provisions for Other Trades: Provide sleeves, blockouts, and inserts in concrete formwork to accommodate work of other trades, including those under separate prime contracts (if any). Determine size and location of openings, recesses, and chases from trades requiring such items. Accurately place and securely support items to be built into forms. In case of conflict with reinforcing or structural embeds, consult Architect before placing.

N. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before placing concrete. If required to eliminate leaks retighten forms after concrete placement. Where forms are extended for subsequent concrete placement at a construction joint, extended area shall be recleaned and retightened before the next pour. Align and secure extended portion to prevent an offset at joint.

O. Forming Foundation Elements: Sides of all below grade portions of grade beams, pier caps and walls shall be formed straight and to lines and grades detailed. Do not cast sides of foundation elements directly against earth excavation except where specifically permitted by note on Drawings. Backfill as specified after form removal.

3.2 FORM COATINGS

A. Coat form contact surfaces with form release agent before reinforcement is placed. Do not allow excess material to accumulate in forms or to come into contact with reinforcement or surfaces which will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions.

B. Coat steel forms, except for corrugated permanent metal forms, with non-staining, rust-preventative release agent or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Edge Forms and Screed Strips: Set edge forms or bulkheads and intermediate screed strips for slabs, to obtain required elevations and contours in finished slab surface. Provide and secure units to support types of screeds required.

3.4 INSTALLATION OF CARTON FORMS (VOID BOXES)

A. Install carton forms in bottom of all grade beam and wall forms, under slabs, around piers, and elsewhere as indicated on Drawings. Bottoms of concrete members which are supported on piers including walls, pilasters, grade beams and overhanging portions of pier caps shall be separated from the expansive clay by carton forms.

B. Provide end caps at discontinuous ends of void boxes at piers and corners, and tape all joints with reinforced packing tape so concrete will not enter void space during placement of
Concrete. Butt pre-manufactured carton forms into sides of piers, using special pieces as required, so concrete will not run down between the pier and void box. Do not leave gaps between void box sections. Do not allow any part of carton form to fall within pier circumference causing a reduction in load transfer area.

C. Protect carton forms from rain and on-site seepage. Do not install carton forms during wet weather or on wet ground. Carton forms which become saturated and weak prior to pouring concrete shall be removed and replaced. Void material must be kept dry prior to placement.

D. Exercise care in placement of concrete to avoid crushing carton forms under dead weight of concrete. Collapsed forms under beams shall be dug out after concrete has cured and a proper void space shall be created by installing precast concrete soil retainers. Collapsed forms under slabs will require removal of affected slab and reconstruction. Submit details of proposed corrective work before proceeding.

3.5 REMOVAL OF FORMS

A. Formwork not supporting concrete such as sides of beams, walls, columns, and similar parts of work, may be removed after cumulatively curing at not less than 50° F. (10° C.) for 12 hours after placing concrete, provided concrete has hardened sufficiently to not be damaged by form removal operations, and provided that curing and protection operations are maintained.

B. Formwork supporting weight of conventionally reinforced concrete, such as beam soffits, joist bottoms, and slab forms, shall not be removed until concrete has attained 85% of its specified 28 day compressive strength as established by tests of field cured cylinders. In the absence of cylinder tests, supporting formwork shall remain in place until concrete has cured at a temperature of at least 50° F. for the minimum cumulative time periods given in ACI 347. When temperature of the air surrounding concrete is below 50° F., that time period, in hours or days, shall be added to the minimum listed time periods.

C. Responsibility for obtaining strength tests for purposes of form removal rests solely with Contractor.

D. Forms for two-way conventionally reinforced slabs shall remain in place for at least the minimum cumulative time periods specified for one-way slabs of the same maximum span, however, they shall be immediately reshores. Reshores shall remain in place until two-way slab has attained its full 28-day design strength.

E. Minimum cumulative time periods may be reduced by use of high-early strength cement or forming systems which allow form removal without disturbing shores, but only after Contractor has conclusively demonstrated, to the satisfaction of Architect, that earlier form removal will not cause excessive sag, creep, distortion nor damage of any kind to member or structure.

F. Observance of the minimum cumulative time periods specified does not relieve Contractor of the responsibility for safety of the structure during construction.

G. Wood forms shall be completely removed from under floors, ramps, steps, and similar places (through temporary openings, if necessary) so that no material will be left to rot or be infested by insects. Exercise care, in removal of any form, to avoid damaging concrete surfaces.

H. Where stripping time is less than specified protective curing time, measures shall be taken to provide adequate curing and thermal protection to the stripped concrete.

I. Areas required to support construction loads in excess of 20 psf shall be reshored as necessary to properly distribute loads. Construction loads up to the rated live load capacity may be placed on unshored concrete construction once concrete has attained its 28-day design strength.
3.6 REUSE OF FORMS

A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable. Apply new form release agent to concrete contact surfaces as specified for new formwork.

B. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

C. Replace damaged pan forms. Pan forms used for exposed surfaces shall be free of dents, warps, and kinks, and shall nest tightly to produce straight and true surfaces.

3.7 CLEANUP

A. Clean up all debris caused by the work of this Section, keeping the area clean and neat at all times.

END OF SECTION
SECTION 031513 - EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS

PART 1   GENERAL

1.01   REFERENCES
The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 111 (2011) Standard Method of Test for Mineral Matter or Ash in Asphalt Materials

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1995; R 2004) Basic Hardboard

ASME INTERNATIONAL (ASME)

ASME BPVC SEC IX (2010) BPVC Section IX-Welding and Brazing Qualifications

ASTM INTERNATIONAL (ASTM)


ASTM C919 (2012) Use of Sealants in Acoustical Applications


EXP CONTR JOINTS AND WATERSTOPS

ASTM D2835 (1989; R 2012) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements
ASTM D4 (1986; R 2010) Bitumen Content

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 572 (1974) Corps of Engineers Specifications for Polyvinylchloride Waterstops

1.03 SUBMITTALS
Submit the following in accordance with Section 013300 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings
Waterstops

SD-03 Product Data
Preformed Expansion Joint Filler
Sealant
Waterstops

SD-04 Samples
Not Required

SD-07 Certificates
Preformed Expansion Joint Filler
Sealant
Waterstops

1.04 DELIVERY, STORAGE, AND HANDLING
Protect material delivered and placed in storage off the ground from moisture, dirt, and other contaminants. Deliver sealants in the manufacturer's original unopened containers. Remove sealants from the site whose shelf life has expired.
**PART 2 PRODUCTS**

2.01 **CONTRACTION JOINT STRIPS**
Contraction joint strips shall be 1/8 inch thick tempered hardboard conforming to AHA A135.4, Class 1. In lieu of hardboard strips, rigid polyvinylchloride (PVC) or high impact polystyrene (HIPS) insert strips specifically designed to induce controlled cracking in slabs on grade may be used. Such insert strips shall have removable top section.

2.02 **PREFORMED EXPANSION JOINT FILLER**
Expansion joint filler shall be preformed material conforming to ASTM D1751 or ASTM D1752, Type I, or resin impregnated fiberboard conforming to the physical requirements of ASTM D1752. Submit certified manufacturer's test reports for premolded expansion joint filler strips, compression seals and lubricant, and metallic waterstops to verify compliance with applicable specification. Unless otherwise indicated, filler material shall be 3/8 inch thick and of a width applicable for the joint formed. Backer material, when required, shall conform to ASTM D5249.

2.03 **SEALANT**
Joint sealant shall conform to the following:

A. Preformed Polychloroprene Elastomeric Type
   ASTM D2628.

B. Lubricant for Preformed Compression Seals
   ASTM D2835.

C. Field-Molded Type
   ASTM C920. Sealant shall be Type M, Grade P or NS, Class 25, Use T for horizontal joints. Type M, Grade NS, Class 25, Use NT for vertical joints. Except, the joint sealant that will be submerged underwater for part or all of its service life shall meet the requirements of USE I. Bond breaker material shall be polyethylene tape, coated paper, metal foil or similar type materials. The back-up material shall be compressible, non-shrink, nonreactive with sealant, and non-absorptive material type such as extruded butyl or polychloroprene rubber.

D. Hot-Applied Jet-Fuel Resistant Type
   ASTM D7116, Type I

2.04 **WATERSTOPS**
Shop fabricate intersection and change of direction waterstops.

A. Flexible Metal
   Copper waterstops shall conform to ASTM B152/B152M and ASTM B370, O60 soft anneal temper and 20 oz mass per sq ft sheet thickness. Stainless steel waterstops shall conform to ASTM A167 and ASTM A480/A480M, UNS S30453 (Type 304L), and 0.0375 inch (20 gauge) thick strip.

B. Rigid Metal
   Flat steel waterstops shall conform to ASTM A109/A109M, No. 2 (half hard) temper, No. 2 edge, No. 1 (matte or dull) finish or ASTM A1011/A1011M, Grade 40.

C. Non-Metallic Materials
   Non-metallic waterstops shall be manufactured from a prime virgin resin; reclaimed material is not acceptable. The compound shall contain plasticizers, stabilizers, and other additives to meet specified requirements. Rubber waterstops shall conform to COE CRD-C 513. Polyvinylchloride waterstops shall conform to COE CRD-C 572. Thermoplastic elastomeric rubber waterstops shall conform to ASTM D471.

D. Non-Metallic Hydrophilic
   Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water shall conform to ASTM D412 as follows: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness shall be 50 minimum on the type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F shall be 3 to 1 minimum.
E. Preformed Elastic Adhesive

Produce preformed plastic adhesive waterstops from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler, containing no solvents, asbestos, irritating fumes or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength.

1. Chemical Composition

Meet the chemical composition of the sealing compound requirements shown below:

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<thead>
<tr>
<th>COMPONENT</th>
<th>MINIMUM</th>
<th>MAXIMUM</th>
<th>TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitumen (Hydrocarbon plastic)</td>
<td>50</td>
<td>70</td>
<td>ASTM D4</td>
</tr>
<tr>
<td>Inert Mineral Filler</td>
<td>30</td>
<td>50</td>
<td>AASHTO T 111</td>
</tr>
<tr>
<td>Volatile Matter</td>
<td>2</td>
<td></td>
<td>ASTM D6/D6M</td>
</tr>
</tbody>
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2. Adhesion Under Hydrostatic Pressure

The sealing compound shall not leak at the joints for a period of 24 hours under a vertical 6 foot head pressure. In a separate test, the sealing compound shall not leak under a horizontal pressure of 10 psi which is reached by slowly applying increments of 2 psi every minute.

3. Sag of Flow Resistance

Sagging shall not be detected when tested as follows: Fill a wooden form 1 inch wide and 6 inches long flush with sealing compound and place in an oven at 135 degrees F in a vertical position for 5 days.

4. Chemical Resistance

The sealing compound when immersed separately in a 5 percent solution of caustic potash, a 5 percent solution of hydrochloric acid, 5 percent solution of sulfuric acid and a saturated hydrogen sulfide solution for 30 days at ambient room temperature shall show no visible deterioration.

2.05 TESTS, INSPECTIONS, AND VERIFICATIONS

A. Materials Tests

Not required

B. Splicing Waterstops

1. Procedure and Performance Qualifications

Demonstrate procedure and performance qualifications for splicing waterstops in the presence of the Engineer. Submit procedures for splicing waterstops for approval.

2. Non-Metallic Waterstops

Demonstrate procedure and performance qualifications for splicing non-metallic waterstops by the manufacturer at the factory and the Contractor at the job site by each making three spliced samples of each size and type of finished waterstop.

3. Metal Waterstops

Demonstrate procedure and performance qualifications for splicing metal waterstops at the job site by the Contractor. The brazing procedure, brazers and brazing operators for splicing copper waterstops shall be qualified in accordance with Part QB (Brazing), Article XI (Brazing, General Requirements), paragraph QB-170 (Peel Tests) and other applicable requirements of Articles XI, XII, and XIII of ASME BPVC SEC IX. The welding procedure and welders for splicing stainless steel waterstops shall be qualified in accordance with the manufacturer’s recommendations.
PART 3 EXECUTION

3.01 INSTALLATION
Joint locations and details, including materials and methods of installation of joint fillers and waterstops, shall be as specified and indicated. In no case shall any fixed metal be continuous through an expansion or contraction joint.

A. Contraction Joints
Contraction joints may be constructed by inserting tempered hardboard strips or rigid PVC or HIPS insert strips into the plastic concrete using a steel parting bar, when necessary, or by cutting the concrete with a saw after concrete has set. Make joints 1/8 inch to 3/16 inch wide and extend into the slab one-fourth the slab thickness, minimum, but not less than 1 inch.

1. Joint Strips
Provide strips of the required dimensions and as long as practicable. After the first floating, groove the concrete with a tool at the joint locations. Insert the strips in the groove and depress them until the top edge of the vertical surface is flush with the surface of the slab. Float and finish the slab as specified. Working of the concrete adjacent to the joint shall be the minimum necessary to fill voids and consolidate the concrete. Where indicated, saw out the top portion of the strip after the curing period to form a recess for sealer. Discard the removable section of PVC or HIPS strips and leave the insert in place. Maintain true alignment of the strips during insertion.

2. Sawed Joints
Saw joints early enough to prevent uncontrolled cracking in the slab, but late enough that this can be accomplished without appreciable spalling. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent raveling of the edges of the saw cut. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. Use concrete sawing machines that are adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Cut joints to true alignment and in sequence of concrete placement. Remove sludge and cutting debris. Form reservoir for joint sealant.

B. Expansion Joints
Use preformed expansion joint filler in expansion and isolation joints in slabs around columns and between slabs on grade and vertical surfaces where indicated. Extend the filler to the full slab depth, unless otherwise indicated. Neatly finish the edges of the joint with an edging tool of 1/8 inch radius, except where a resilient floor surface will be applied. Where the joint is to receive a sealant, the filler strips shall be installed at the proper level below the finished floor with a slightly tapered, dressed and oiled wood strip temporarily secured to the top to form a recess to the size shown on the drawings. Remove the wood strip after the concrete has set. Contractor may opt to use a removable expansion filler cap designed and fabricated for this purpose in lieu of the wood strip. Thoroughly clean the groove of laitance, curing compound, foreign materials, protrusions of hardened concrete, and any dust. If blowing out the groove use oil-free compressed air.

C. Joint Sealant
Fill sawed contraction joints and expansion joints in slabs with joint sealant, unless otherwise shown. Joint surfaces shall be clean, dry, and free of oil or other foreign material which would adversely affect the bond between sealant and concrete. Apply joint sealant as recommended by the manufacturer of the sealant.

1. Joints With Preformed Compression Seals
Install compression seals with equipment capable of installing joint seals to the prescribed depth without cutting, nicking, twisting, or otherwise distorting or damaging the seal or concrete and with no more than 5 percent stretching of the seal. Cover the sides of the joint and, if necessary, the sides of the compression seal with a coating of lubricant. Coat butt joints with liberal applications of lubricant.
2. Joints With Field-Molded Sealant
   Do not seal joints when the sealant material, ambient air, or concrete temperature is less than 40 degrees F. When the sealants are meant to reduce the sound transmission characteristics of interior walls, ceilings, and floors the guidance provided in ASTM C919 shall be followed. Coat joints requiring a bond breaker with curing compound or with bituminous paint. Install bond breaker and back-up material where required. Joints shall be primed and filled flush with joint sealant in accordance with the manufacturer's recommendations.

3.02 WATERSTOPS, INSTALLATION AND SPLICES
   Install waterstops at the locations shown to form a continuous water-tight diaphragm. Embed the bottom of each waterstop a minimum of 6 inches in firm rock or sealed to other cut-off systems. Make adequate provision to support and completely protect the waterstops during the progress of the work. Repair or replace any waterstop punctured or damaged. Protect exposed waterstops during application of form release agents to avoid being coated. Provide suitable guards to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued. Accomplish splices with certified trained personnel using approved equipment and procedures.

   A. Copper And Stainless Steel
      Splices in copper waterstops shall be lap joints made by brazing. Splices in stainless steel waterstops shall be welded using a TIG or MIG process utilizing a weld rod to match the stainless. All welds shall not be annealed to maintain physical properties. Do not use carbon flame in the annealing process. Damaged waterstops shall be repaired by removing damaged portions and patching. Patches shall overlap a minimum of 1 inch onto undamaged portion of the waterstop.

   B. Flat Steel
      Splices in flat steel waterstops shall be properly aligned, butt welded, and cleaned of excessive material.

   C. Non-Metallic
      Fittings shall be shop made using a machine specifically designed to mechanically weld the waterstop. A miter guide, proper fixturing (profile dependant), and portable power saw shall be used to miter cut the ends to be joined to ensure good alignment and contact between joined surfaces. The splicing of straight lengths shall be done by squaring the ends to be joined. Maintain continuity of the characteristic features of the cross section of the waterstop (ribs, tabular center axis, protrusions, etc.) across the splice.

      1. Rubber Waterstop
         Splices shall be vulcanized or shall be made using cold bond adhesive as recommended by the manufacturer. Splices for TPE-R shall be as specified for PVC.

      2. Polyvinyl Chloride Waterstop
         Make splices by heat sealing the adjacent waterstop edges together using a thermoplastic splicing iron utilizing a non-stick surface specifically designed for waterstop welding. Use the correct temperature to sufficiently melt without charring the plastic. Reform waterstops at splices with a remolding iron with ribs or corrugations to match the pattern of the waterstop. The spliced area, when cooled, shall show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.

      3. Quality Assurance
         Edge welding will not be permitted. Compress or close centerbulbs when welding to non-centerbulb type. Waterstop splicing defects which are unacceptable include, but are not limited to the following: 1) Tensile strength less than 80 percent of parent section. 2) Free lap joints. 3) Misalignment of centerbulb, ribs, and end bulbs greater than 1/16 inch. 4) Misalignment which reduces waterstop cross section more than 15 percent. 5) Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness. 6) Misalignment of waterstop splice resulting in misalignment of waterstop in excess of 1/2 inch in 10 feet. 7) Visible porosity in the weld area, including pin holes. 8) Charred or burnt material. 9) Bubbles or inadequate bonding. 10) Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.

   D. Non-Metallic Hydrophilic Waterstop Installation
      Miter cut ends to be joined with sharp knife or shears. The ends shall be adhered with cyanoacrylate (super glue) adhesive. When joining hydrophilic type waterstop to PVC waterstop, the hydrophilic
waterstop shall be positioned as shown on the drawings. Apply a liberal amount of a single component hydrophilic sealant to the junction to complete the transition.

E. Preformed Plastic Adhesive Installation
The installation of preformed plastic adhesive waterstops shall be a prime, peel, place and pour procedure. Joint surfaces shall be clean and dry before priming and just prior to placing the sealing strips. The end of each strip shall be spliced to the next strip with a 1 inch overlap; the overlap shall be pressed firmly to release trapped air. During damp or cold conditions the joint surface shall be flashed with a safe, direct flame to warm and dry the surface adequately; the sealing strips shall be dipped in warm water to soften the material to achieve maximum bond to the concrete surface.

3.03 CONSTRUCTION JOINTS
Treat construction joints coinciding with expansion and contraction joints as expansion or contraction joints as applicable.

END OF SECTION 031513
SECTION 03 2000 - CONCRETE REINFORCING AND EMBEDDED METAL ASSEMBLIES

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

A. The Drawings and General Provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to work specified in this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Furnish all labor, materials, services, equipment and appliances required in conjunction with the fabrication, delivery and placement of reinforcement and embedded metal assemblies for cast-in-place concrete, including bars, welded wire fabric, ties and supports.

B. Extent of reinforcement and embedded metal assemblies for cast-in-place concrete is shown on Drawings and in schedules.

C. Related Work Specified in Other Sections:
   1. Testing laboratory services: Section 01 4529.
   2. Reinforcement in conjunction with drilled piers: Section 31 6329.
   3. Reinforcement in conjunction with masonry: Section 04 2000.
   4. Sustainable Design Requirements: Section 01 8113.

1.3 QUALITY CONTROL

A. Latest adopted edition of all standards referenced in this Section shall apply, unless noted otherwise. In case of conflict between Contract Documents and a referenced standard, Contract Documents shall govern. In case of conflict between Contract Documents and Building Code, the more stringent shall govern.

B. Testing Laboratory Services: Refer to Section 01 4529.

C. Codes and Standards: Comply with provisions of the following Codes, Specifications and Standards, except as otherwise indicated:
   2. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
   3. American Concrete Institute, ACI 318, "Building Code Requirements for Reinforced Concrete."
   6. "Details and Detailing of Concrete Reinforcement," ACI 315.

D. Mock-up or Sample Panels: Provide reinforcement and embedded metal assemblies for mock-up or sample panels as specified in Section 03 3000 "Cast-in-place Concrete."

1.4 SUBMITTALS

A. Product Data: Submit manufacturers' product data, Specifications, and installation instructions for proprietary materials and reinforcement accessories.

B. Mill Certificates: Submit, for Architect's record, steel producer's certificates of mill analysis, tensile and bend tests for reinforcing steel.

C. Shop Drawings:
1. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show bar schedules, stirrup spacing, diagrams of bent bars, arrangements, and assemblies, as required for fabrication and placement of concrete reinforcement.

2. Shop fabricator shall reproduce bar bending diagrams, beam, slab and joist notes, and cast-in-place concrete notes that concern proper placing of reinforcement and submit same with each set of shop drawings for field use. Use same bar marks indicated on bar bending diagrams as shown in beam, joist, and slab schedules.

3. Submit shop drawings for fabrication and placement of embedded metal assemblies and concrete accessories not completely described in product data information. Use standard AWS welding symbols.

D. Documentation for LEED Credit MR 4.1 and Credit MR 4.2: For products having recycled content. Indicate percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

E. Documentation for LEED Credit MR 5.1 and Credit MR 5.2: For products that are extracted, harvested or recovered and manufactured from within 500 miles of Project. Indicate location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw or recycled material. Include statement indicating costs for each product that is regionally extracted, harvested or recovered and manufactured.

F. Documentation for LEED Credit EQ 4.1 and 4.2: Paints, coatings, adhesives, sealants, stains, caulk, firestopping, etc. inside the weatherproofing systems and applied on site only in this specification must comply with the VOC limits in Section 01 8113. Include product data sheet or MSDS clearly showing VOC content of product in grams/Liter.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver reinforcement and embedded metal assemblies to project site bundled, tagged, and marked. Use metal tags indicating bar sizes, lengths, and other information corresponding to markings shown on placement diagrams.

B. Store concrete reinforcement materials and embedded metal assemblies at site in such a manner as to prevent damage and accumulation of dirt or excessive rust.

1.6 JOB CONDITIONS

A. Coordinate delivery and installation of reinforcement and embedded metal assemblies with work of other trades.

PART 2 PRODUCTS

2.1 GENERAL

A. All products shall be extracted, harvested or recovered and manufactured from within 500 miles of Project. All reinforcing bar and steel components shall contain minimum 95% recycled content, all raw materials shall be manufactured and extracted within 500 miles of Project site and all recycled materials shall be manufactured and recovered within 500 miles of the Project site.

B. All paints, coatings, adhesives, sealants, stains, caulk, firestopping, etc. applied inside the weatherproofing systems and on site only in this specification must comply with the VOC limits in Section 01 8113. In submittal, include product data sheet or MSDS clearly showing VOC content of product in grams/Liter.

2.2 MATERIALS
A. Reinforcing Bars: ASTM A 615, "Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement." Use grades as indicated on Drawings.


C. Bar and Rod Mats: ASTM A 184, "Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement."

D. Steel Wire: ASTM A 82, "Specification for Steel Wire, Plain, for Concrete Reinforcement."

E. Deformed Wire: ASTM A 496, "Specification for Steel Wire, Deformed, for Concrete Reinforcement."

F. Welded Smooth Wire Fabric: ASTM A 185, "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete." Furnish in flat sheets, not rolls, except that No. 10 gauge (W1.4) and smaller wire may be rolled.

G. Column Spirals: Plain, cold-drawn wire, ASTM A 82, or hot-rolled rods for spirals, ASTM A 615.

H. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place.
   1. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, and other unacceptable materials.
   2. For slabs-on-grade, use precast concrete blocks or wire supports with sand plates or horizontal runners which will not sink into subgrade or puncture vapor retarder.
   3. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with plastic protected legs (CRSI, Class 1) or stainless steel protected legs (CRSI, Class 2).
   4. For abrasive-blasted or bush-hammered concrete provide plastic protected bar supports (CRSI, Class 1).
   5. Over waterproof membranes use precast concrete block bar supports to prevent penetration of membrane.

2.3 METAL ANCHORAGE AND EMBEDDED METAL ASSEMBLIES

A. Steel Shapes and Plates: Conform to ASTM A 36, "Standard Specification for Carbon Structural Steel."

B. Headed Stud Anchors: Headed studs welded by full-fusion process, as furnished by TRW Nelson Stud Welding Division.


D. Anchor Bolts (Anchor Rods): For anchoring the structural frame, refer to frame section. For anchoring other materials and equipment, refer to trade requiring them for material properties. Sizes as indicated.

E. Welding Electrodes: AWS 5.5, Series E70.

F. Welded Deformed Bar Anchors: Welded by full-fusion process, as furnished by TRW Nelson Stud Welding Division.

G. Reinforcing Bars to be Welded: ASTM A 706.

H. All metal assemblies exposed to earth, weather or moisture shall be hot-dip galvanized. All other metal assemblies shall be either hot-dip galvanized or exposed surfaces shall be field painted with specified epoxy coating after completing any welds.
2.4 INSERTS

A. Provide metal inserts, for anchorage of materials or equipment to concrete construction, not supplied by other trades and as required for work.
   1. In vertical concrete faces, to transfer direct shear loads only, provide adjustable wedge inserts of malleable cast iron, complete with bolts, nuts, and washers; 3/4" bolt size, unless otherwise indicated.
   2. In horizontal concrete faces and whenever tension forces are applied, provide threaded inserts of malleable cast iron, furnished complete with full-depth bolts; 3/4" bolt size, unless otherwise indicated.

2.5 DOWEL BAR ANCHORS

A. Provide dowel bar anchors and threaded dowels designed to develop, both in tension and compression, 125% of the minimum ASTM specified yield strength of the dowel bars, as evidenced by published ICC-ES test reports. Unless otherwise indicated, anchors shall be furnished with ACI standard 90 degree hooks. Dowels shall be furnished by anchor supplier. The following dowel splicing systems are acceptable:
   1. Richmond Screw Anchor "Dowel Bar Splicer."
   2. Erico "Lenton Form Saver."
   3. Dayton Barsplice "Grip-Twist."

2.6 COATINGS


B. Field repair of galvanizing shall be done with "ZRC Zero VOC Cold Galvanizing Compound," by ZRC Chemical Products Co., Marshfield, MA. Coating shall qualify as low VOC material under LEED 2009 for Healthcare requirements.

2.7 FABRICATION OF REINFORCEMENT

A. General: Fabricate reinforcing bars to required shapes and dimensions, with fabrication tolerances complying with CRSI "Manual of Standard Practice." Combined tolerances for formwork, reinforcing fabrication, and reinforcing placement shall not permit a reduction in specified concrete cover of reinforcing steel. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken material.

B. Unacceptable Materials: Reinforcement with any of the following defects will not be permitted in work:
   1. Bar lengths, depths, and bends exceeding specified tolerances.
   2. Bends or kinks not indicated on drawings or final shop drawings.
   3. Bars with reduced cross-section due to excessive rusting or other cause.

2.8 FABRICATION OF METAL ACCESSORIES AND EMBEDDED METAL ASSEMBLIES

A. Fabricate and assemble structural steel items in the shop. Shearing, flame cutting, and chipping shall be done carefully and accurately. Holes shall be cut, drilled, or punched at right angles to the surface of metal and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges. Welded construction shall conform to AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings," and AWS D1.1. Welding shall be done by AWS certified welders.

B. Welding of deformed bar anchors and headed stud anchors shall be done by full-fusion process equal to that of TRW Nelson Stud Welding Division or KSM Welding Services Division, Omark, Ind. A minimum of 2 headed studs shall be tested at start of each production period for proper quality control. Studs shall be capable of being bent 45 degrees without weld failure.
C. Welding of reinforcement shall be done in strict accordance with AWS requirements, using recommended preheat temperature and electrode for type of reinforcement being welded. Bars larger than No. 9 shall not be welded. Welding shall be performed subject to the observance and testing of testing laboratory.

D. Coatings, where required, shall be applied after fabrication and prior to casting concrete.

PART 3 EXECUTION

3.1 INSPECTION

A. Installer shall inspect excavations, fills, vapor retarders, forms, and any other items of related construction upon which proper installation of reinforcement is dependent and report any unsatisfactory conditions to Contractor.

3.2 INSTALLATION

A. Comply with specified codes and standards, and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports.

B. Clean reinforcement to remove loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Before casting, accurately position, support, and secure all reinforcement against displacement caused by workmen, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. Do not "stab in" dowels after casting concrete.

1. Place reinforcement to obtain minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so twisted ends are directed away from exposed concrete surfaces.

2. Hold bars in beams and slabs in exact locations during placing of concrete within following tolerances:
   a. Top and bottom bars in slabs, girders, beams and joists:
      1) Members 8" deep or less: \( \pm 3/8" \).
      2) Members more than 8" deep: \( \pm \frac{1}{2}" \).
   b. Lengthwise of members: \( \pm 2" \).
   c. Concrete cover to formed or finished surfaces: \( + 3/8" \) for members 8" deep or less; \( + \frac{1}{2}" \) for members over 8" deep; except tolerance for cover shall not exceed 1/3 of the specified cover.
   d. Combined tolerances for formwork, reinforcing fabrication, and reinforcing placement shall not permit a reduction in specified concrete cover of reinforcing steel.

3. Do not place bar support against exposed faces of precast beams, columns, walls, or copings.

4. Tie wire shall be bent away from exposed surfaces so it is never closer to surface than specified cover.

5. Minimum concrete cover for reinforcing steel shall be as shown on the Drawings.

D. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with 16 gauge wire. Do not make end laps midway between supporting beams, or directly over beams of continuous structures. Offset end laps in adjacent widths to prevent continuous laps.

E. Provide adequate numbers of supports having sufficient strength to carry reinforcement. Do not place reinforcement bars more than 2" beyond last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
F. Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying. Comply with requirements of ACI 318, for minimum lap of spliced bars. Bars No. 14 and larger shall not be lap spliced.

G. Use mechanical splices for splicing of bars larger than No. 11, or where No. 11 bars are spliced to larger size bars, and elsewhere as shown. Comply with manufacturer's directions for preparation of bars and installation procedures.

H. Welding of Reinforcing Steel: Comply with requirements of AWS D1.4, for field welding. Prior to field welding, determine weldability of reinforcing bars by laboratory chemical analysis of steel. Only steel conforming to ASTM A 706 may be welded.

I. Field Welding of Embedded Metal Assemblies: All paint and galvanizing shall be removed, in areas to receive field welds, prior to making welds. All areas where paint or galvanizing has been removed or damaged shall be field repaired with two coats of specified field coating.

3.3 CLEANUP

A. Clean up all debris caused by work of this Section, keeping the area clean and neat at all times.

END OF SECTION
PART 1  GENERAL

1.01  UNIT PRICES

NOT USED

1.02  REFERENCES
The publications listed below form a part of this specification to the extent referenced. The publications
are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 318  (2011; Errata 2011; Errata 2012) Building Code
Requirements for Structural Concrete and Commentary

ACI 318M  (2011; Errata 2013) Building Code Requirements for
Structural Concrete & Commentary


AMERICAN WELDING SOCIETY (AWS)

AWS D1.4/D1.4M  (2011) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A1035/A1035M  (2011) Standard Specification for Deformed and Plain,
Low-carbon, Chromium, Steel Bars for Concrete Reinforcement

Deformed Steel Bar Mats for Concrete Reinforcement

Reinforcement, Plain, for Concrete

ASTM A370  (2012a) Standard Test Methods and Definitions for
Mechanical Testing of Steel Products

for Concrete Reinforcement

Reinforcement, Deformed, for Concrete

Hot-Dipped, Zinc-Coated, Welded and Seamless

Carbon-Steel Bars for Concrete Reinforcement

ASTM A675/A675M  (2003; R 2009) Standard Specification for Steel Bars,
Carbon, Hot-Wrought, Special Quality, Mechanical Properties
ASTM A706/A706M  (2009b) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775/A775M  (2007b) Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM E94  (2004; R 2010) Radiographic Examination

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

U.S. DEPARTMENT OF DEFENSE (DOD)
UFC 3-310-04  (2012) Seismic Design for Buildings

1.03 SUBMITTALS
Submit the following in accordance with Section 013300 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings
Reinforcement
SD-03 Product Data
Welding
Butt-Splices
Material
SD-04 Samples
None
SD-06 Test Reports
Material
Tests, Inspections, and Verifications
SD-07 Certificates
Reinforcing Steel
Qualification of Steel Bar Butt-SPLICERS

1.04 QUALITY ASSURANCE
A. Welding Qualifications
Welders shall be qualified in accordance with AWS D1.4/D1.4M. Qualification test shall be performed at the worksite and notify the Engineer 24 hours prior to conducting tests. Special welding procedures and welders qualified by others may be accepted as permitted by AWS D1.4/D1.4M. Submit a list of qualified welders' names.

B. Qualification of Steel Bar Butt-Splacers
Qualification of steel bar butt-splicers shall be certified to have satisfactorily completed a course of instruction in the proposed method of butt-spooling or have satisfactorily performed such work within the preceding year. Submit certificates on the Qualifications of Steel Bar Butt-Splacers prior to commencing butt-spooling.

C. Qualification of Butt-Spooling Procedure
As a condition of approval of the butt-spooling procedure, make three test butt-splices of steel bars of each size to be spliced using the proposed butt-spooling method, in the presence of the Engineer. These test butt-splices and unspliced bars of the same size shall be tension tested to destruction with stress-strain curves plotted for each test. Test results shall show that the butt-splices meet the specified strength and deformation requirements in order for the splicing procedure to be approved.

1.05 DELIVERY, STORAGE, AND HANDLING
Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 PRODUCTS

2.01 DOWELS
Dowels shall conform to ASTM A675/A675M, Grade 80. Steel pipe conforming to ASTM A53/A53M, Schedule 80, may be used as dowels provided the ends are closed with metal or plastic inserts or with mortar.

2.02 FABRICATED BAR MATS
Fabricated bar mats shall conform to ASTM A184/A184M.

2.03 REINFORCING STEEL
Reinforcing steel shall be deformed bars conforming to ASTM A615/A615M, ASTM A706/A706M, or ASTM A1035/A1035M grades and sizes as indicated. Cold drawn wire used for spiral reinforcement shall conform to ASTM A82/A82M. In highly corrosive environments or when directed by the Engineer, reinforcing steel shall conform to ASTM A767/A767M, ASTM A775/A775M, ASTM A1035/A1035M or ASTM A934/A934M as appropriate.

Submit certified copies of mill reports attesting that the reinforcing steel furnished contains no less than 25 percent recycled scrap steel and meets the requirements specified herein, prior to the installation of reinforcing steel.

A. Epoxy-Coated Bars
Epoxy-coated steel bars shall comply with the requirements of ASTM A775/A775M, including written certifications for coating material and coated bars, sample of coating material, and 1.5 pounds of patching material.

2.04 WELDED WIRE FABRIC
Welded wire fabric shall conform to ASTM A185/A185M. When directed by the Engineer for special applications, welded wire fabric shall conform to ASTM A884/A884M. For wire with a specified yield strength (fy) exceeding 60,000 psi, fy shall be the stress corresponding to a strain of 0.35 percent.

2.05 WIRE TIES
Wire ties shall be 16 gauge or heavier black annealed steel wire. Ties for epoxy-coated bars shall be vinyl-coated or epoxy-coated.

2.06 SUPPORTS
Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI 10MSP and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 4 inches square when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be...
exposed to weather or where surfaces are to be painted, steel supports within 1/2 inch of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

Bar supports shall comply with the requirements of ACI SP-66. Supports for bars in concrete with formed surfaces exposed to view or to be painted shall be plastic-coated wire, stainless steel or precast concrete supports. Precast concrete supports shall be wedged-shaped, not larger than 3-1/2 by 3-1/2 inches, of thickness equal to that indicated for concrete cover and have an embedded hooked tie-wire for anchorage. Bar supports used in precast concrete with formed surfaces exposed to view shall be the same quality, texture and color as the finish surfaces.

2.07 SYNTHETIC FIBER REINFORCEMENT
Synthetic fiber shall be polypropylene with a denier less than 100 and a nominal fiber length of 2 inches.

2.08 TESTS, INSPECTIONS, AND VERIFICATIONS
Perform material tests, specified and required by applicable standards, by an approved laboratory and certified to demonstrate that the materials are in conformance with the specifications. Tests, inspections, and verifications shall be performed and certified at the Contractor's expense.

A. Reinforcement Steel Tests
Mechanical testing of steel shall be in accordance with ASTM A370 except as otherwise specified or required by the material specifications. Tension tests shall be performed on full cross-section specimens using a gage length that spans the extremities of specimens with welds or sleeves included. Chemical analyses of steel heats shall show the percentages of carbon, phosphorous, manganese, sulphur and silicon present in the steel.

B. Radiographic Examination of Welds
Radiographic examination of welds shall be in accordance with ASTM E94 and shall be performed and evaluated by an approved testing agency adequately equipped to perform such services. Radiographs of welds and evaluations of the radiographs submitted for approval shall become the property of the Government.

PART 3 EXECUTION

3.01 REINFORCEMENT
Reinforcement steel and accessories shall be fabricated and placed as specified and shown and approved shop drawings. Fabrication and placement details of steel and accessories not specified or shown shall be in accordance with ACI SP-66 and ACI 318. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Zinc-Coated and epoxy-coated bars shall be mill-bent prior to coating. All steel shall be bent cold unless authorized. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms. Submit detail drawings showing reinforcing steel placement, schedules, sizes, grades, and splicing and bending details. Drawings shall show support details including types, sizes and spacing.

A. Placement
Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318 at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

B. Splicing
Splices of reinforcement shall conform to ACI 318 and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical or welded butt connection; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Welding shall conform to AWS D1.4/D1.4M. Welded butt splices shall be full penetration butt welds. Lapped bars shall be placed
CONCRETE REINFORCEMENT - CIVIL

in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 6 inches. Mechanical butt splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device. Butt splices shall develop 125 percent of the specified minimum yield tensile strength of the spliced bars or of the smaller bar in transition splices. Bars shall be flame dried before butt splicing. Adequate jigs and clamps or other devices shall be provided to support, align, and hold the longitudinal centerline of the bars to be butt spliced in a straight line.

C. Placing Tolerances
1. Spacing
   The spacing between adjacent bars and the distance between layers of bars may not vary from the indicated position by more than one bar diameter nor more than 1 inch.

2. Concrete Cover
   The minimum concrete cover of main reinforcement steel bars shall be as shown. The allowable variation for minimum cover shall be as follows:

<table>
<thead>
<tr>
<th>MINIMUM COVER (inch)</th>
<th>VARIATION (inch)</th>
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<tbody>
<tr>
<td>6</td>
<td>plus 1/2</td>
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<tr>
<td>4</td>
<td>plus 3/8</td>
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<td>3</td>
<td>plus 3/8</td>
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<td>2</td>
<td>plus 1/4</td>
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<td>1-1/2</td>
<td>plus 1/4</td>
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<tr>
<td>1</td>
<td>plus 1/8</td>
</tr>
<tr>
<td>3/4</td>
<td>plus 1/8</td>
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</table>

D. Splicing
Splices in steel bars shall be made only as required. Bars may be spliced at alternate or additional locations at no additional cost to the Government subject to approval.

1. Lap Splices
   Lap splices shall be used only for bars smaller than size 14 and welded wire fabric. Lapped bars may be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than 1/5 the required length of lap or 6 inches.

2. Butt-Splices
   Use butt-splices only for splicing size 14 and 18 bars and for splicing #11 bars to larger bars except where otherwise shown or authorized. Make butt-splices by a method which develops splices suitable for tension, compression and stress reversal applications. Welded butt-splices shall be full penetration butt welds. Butt-splices shall develop 90 percent of the specified minimum ultimate tensile strength of the smallest bar of each splice. Bars shall be cleaned of all oil, grease, dirt, rust, scale and other foreign substances and shall be flame dried before splicing. Adequate jigs and clamps or other devices shall be provided to support, align and hold the longitudinal centerline of the bars to be butt-spliced in a straight line. Submit proposed procedure for butt-splicing steel bars prior to making the test butt-splices for qualification of the procedure. Properties and analyses of steel bars and splicing materials shall be included in the submitted procedure. Physical properties of splicing sleeves shall include length, inside and outside diameters, and inside surface details. Butt-splices shall be as follows:
a. Thermit Welded Butt Splices - Bars to be thermit welded shall be restricted to steel shown by heat analysis to have a sulfur content not exceeding 0.05 percent. The ends of bars to be thermit welded shall be cut square and smooth. Flame cutting will be permitted provided grinding is employed to remove the resulting scale and to square and smooth the cut ends to a condition equivalent to a saw cut. No shearing will be permitted. Bars shall be cleaned and flame dried before splicing. The joint shall be properly aligned in the mold with a gap opening in accordance with the manufacturer's recommendations. Charging and firing shall conform to the manufacturer's recommendations. The end of bars and the welded mold shall be preheated before welding to a temperature of not less than 100 degrees F and the mold shall be left in place for at least 15 minutes after ignition. Risers shall be broken or burned off after removing the mold. Tension splices shall be staggered longitudinally a minimum of 5 feet so that no more than half of the bars are spliced at any one section or as otherwise indicated.

b. Mechanical Butt-Splices - Mechanical butt-splices shall be an approved exothermic, threaded coupling, swaged sleeve or other positive connecting type. Bars to be spliced by a mechanical butt-splicing process may be sawed, sheared or flame cut provided the ends of sheared bars are reshapen after shearing and all slag is removed from the ends of flame cut bars by chipping and wire brushing prior to splicing. Surfaces to be enclosed within a splice sleeve or coupling shall be cleaned by wire brushing or other approved method prior to splicing. Splices shall be made using manufacturer's standard jigs, clamps, ignition devices and other required accessories. In addition to the strength requirements specified paragraph BUTT-SPLICES the additional deformation of number 14 and smaller bars due to slippage or other movement within the splice sleeve shall not exceed 0.015 inches (unit strain 0.0015 inches/inch) beyond the elongation of an unspliced bar based upon a 10 inch gage length spanning the extremities of the sleeve at a stress of 30,000 psi. The additional deformation of number 18 bars shall not exceed 0.03 inches (unit strain 0.003 inches/inch) beyond the elongation of an unspliced bar based upon a 10 inch gage length spanning the extremities of the sleeve at a stress of 30,000 psi. The amount of the additional deformation shall be determined from the stress-strain curves of the unspliced and spliced bars tested as required paragraph QUALIFICATION OF BUTT-SPLICING PROCEDURE for qualification of the butt-splicing procedure. Tension splices of number 14 or smaller bar shall be staggered longitudinally a minimum of 5 feet or as otherwise indicated so that no more than half of the bars are spliced at any one section. Tension splices of number 18 bars shall be staggered longitudinally a minimum of 5 feet so that no more than 1/3 of the bars are spliced at any one section.

3.02 WELDED-WIRE FABRIC PLACEMENT
Welded-wire fabric shall be placed in slabs as indicated. Fabric placed in slabs on grade shall be continuous between expansion, construction, and contraction joints. Fabric placement at joints shall be as indicated. Lap splices shall be made in such a way that the overlapped area equals the distance between the outermost crosswires plus 2 inches. Laps shall be staggered to avoid continuous laps in either direction. Fabric shall be wired or clipped together at laps at intervals not to exceed 4 feet. Fabric shall be positioned by the use of supports.

3.03 DOWEL INSTALLATION
Dowels shall be installed in slabs on grade at locations indicated and at right angles to joint being doweled. Dowels shall be accurately positioned and aligned parallel to the finished concrete surface before concrete placement. Dowels shall be rigidly supported during concrete placement. One end of dowels shall be coated with a bond breaker.

3.04 SYNTHETIC FIBER REINFORCED CONCRETE
Fiber reinforcement shall be added to the concrete mix in accordance with the applicable sections of ASTM C1116/C1116M and the recommendations of the manufacturer, and in an amount of 0.1 percent by volume.

3.05 SPECIAL INSPECTION AND TESTING FOR SEISMIC-RESISTING SYSTEMS
NOT USED
END OF SECTION 03 20 01
SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1   GENERAL

1.1 REFERENCED DOCUMENTS

A. The Drawings and General Provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to work specified in this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Furnish all materials, equipment, transportation and facilities, and perform all labor necessary for the following:
   1. Furnishing and placing cast-in-place concrete.
   2. Grouting structural steel.
   5. Furnish concrete for drilled piers.
   6. Concrete mix designs.
   7. Vapor retarder.

B. Related Work Specified Elsewhere:
   1. Paving, curbs, gutters, and sidewalks.
   2. Reinforcing steel: Section 03 2000.
   3. Precast Concrete Tilt-up Panels: Section 03 4713.
   4. Concrete formwork: Section 03 1000.
   5. Placing of pier concrete: Section 31 6329.
   6. Laboratory testing and inspection: Section 01 4529.
   7. Sustainable Design Requirements: Section 01 8113.

1.3 SUBMITTALS

A. Mix Designs:
   1. Submit two copies of each proposed concrete mix, prepared in accordance with ACI 318, Chapter 5, to Owner's testing agency. Each mix design shall include the following information:
      a. Class of concrete and location.
      b. Specified design strength (f'c).
      c. Proportions of cementitious materials, fine and coarse aggregates, and water.
      d. Maximum water/cement ratio, maximum slump, and air content.
      e. Type and source of cement and other cementitious materials. Submittal shall include a statement from the cement supplier certifying that no hazardous waste materials are used in the fuel mix or raw materials for production of cement.
      f. Type and source of fly ash, if permitted.
      g. Types and sources of aggregates, and maximum size.
      h. Type and dosage of all admixtures.
      i. Type, color, and dosage of integral coloring compounds, where applicable.
      j. Special requirements for pumping.
      k. Range of ambient temperature and humidity for which the design is valid.
      l. Maximum elapsed time before discharge after introduction of water and cement.
      m. Maximum and minimum permissible concrete temperatures at time of placement.
      n. Any special characteristics of the mix which require precautions in mixing, placing, or finishing techniques to achieve finished product specified.
   2. Each mix design shall be accompanied by one of the following prepared in accordance with ACI 318, Chapter 5:
      a. Complete standard deviation analysis based on a suitable record of field tests on a similar mix produced by the plant within the past 12 months and spanning a period of at least 60 calendar days.
b. Documentation for required average compressive strength \( f'_{cr} \) based on Table 5.3.2.2, where an adequate record of strength tests is unavailable. Documentation shall consist of field test data or confirmation cylinders from three trial batches prepared by an independent testing laboratory.

B. Submit Manufacturer's Data Showing Compliance with Specifications for the Following Products:
   1. Curing compounds.
   2. Sealer.
   4. Waterstop.
   5. Floor hardener.
   6. Integral coloring compound.
   7. Retarder.
   8. Samples of fine and coarse aggregates for architectural concrete.

C. Construction Joints: Submit a diagram of proposed construction joints other than those indicated on Drawings.

D. Documentation for LEED Credit MR 4.1 and Credit MR 4.2: For products having recycled content. Indicate percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

E. Documentation for LEED Credit MR 5.1 and Credit MR 5.2: For products that are extracted, harvested or recovered and manufactured from within 500 miles of Project. Indicate location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw or recycled material. Include statement indicating costs for each product that is regionally extracted, harvested or recovered and manufactured.

F. Documentation for LEED Credit EQ 4.1 and 4.2: Paints, coatings, adhesives, sealants, stains, caulk, firestopping, etc. applied on site only in this specification must comply with the VOC limits in Section 01 8113. Include product data sheet or MSDS clearly showing VOC content of product in grams/Liter.

1.4 CONCRETE MIX DESIGNS

A. Selection of Proportions: Ingredients for concrete mixes shall be determined by an independent testing laboratory or qualified concrete supplier, in accordance with requirements of Chapter 5 of ACI 318 to provide characteristics listed on Drawings for each class of concrete.
   1. General: Concrete shall be composed of Portland Cement, fine aggregate, coarse aggregate, water, water-reducing admixture, and an air-entraining admixture, where specified. Proportions of ingredients shall produce a mixture which works readily into corners and angles of forms and around reinforcement without segregation or excessive bleed water forming on the surface. Proportioning of materials shall be in accordance with ACI 211.1, "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete"
   2. Required average strength above specified strength: Determinations shall be based on standard deviation record of the production facility, in accordance with ACI 318, Chapter 5. If a suitable record of strength test performance is not available, proportions shall be selected to produce an average strength \( f'_{cr} \) greater than specified strength \( f'_{c} \) by amount defined in ACI 318, Table 5.3.2.2.
   3. If a testing laboratory provides concrete mix designs, it shall be selected and paid for by the Contractor and approved by the Architect.

1.5 QUALITY CONTROL

A. Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Architect for final acceptance.
B. Refer to Section 01 4529 for required laboratory testing and inspection.

C. Contractor Shall Provide and Pay for the Following Additional Testing Laboratory Services:
   1. Qualification of proposed materials and establishment of mix designs in accordance with ACI 318, Chapter 5, when trial batches are required.
   2. Cylinder tests to verify form removal time.
   3. Other testing services needed or required by Contractor.

D. To Facilitate Testing and Inspection, Contractor Shall:
   1. Furnish necessary labor to assist testing agency in obtaining and handling samples at jobsite.
   2. Advise testing agency sufficiently in advance of operations to allow assignment of testing and personnel.
   3. Provide and maintain, for use of testing agency, adequate facilities for proper curing of concrete test specimens on project site, in accordance with ASTM C 31, “Making and Curing Concrete Test Specimens in the Field.”

E. Evaluation and Acceptance:
   1. Strength level of concrete will be considered satisfactory if averages of all sets of 3 consecutive strength test results equal or exceed specified strength and no individual test result (average of 2 or 3 cylinders, depending on cylinder size) is below specified strength by more than 500 psi.
   2. When strength level of concrete for any portion of the structure, as indicated by cylinder tests, is below specified requirements Contractor shall provide improved curing conditions of temperature and moisture and/or propose adjustments to mix design to secure required strength. Also, if average strength of laboratory control cylinders should fall so low as to be deemed unacceptable, Contractor shall, at his expense, follow core test procedure set forth in ACI 318, Chapter 5, in locations approved by Architect. If results of core tests indicate, in Architects opinion, structural strength is inadequate, such replacement, load testing, or strengthening as may be ordered by Architect shall be provided by Contractor without cost to Owner.

F. Latest adopted edition of all standards referenced in this Section shall apply, unless noted otherwise. In case of conflict between Contract Documents and a referenced standard, Contract Documents shall govern. In case of conflict between Contract Documents and Building Code, the more stringent shall govern.
   1. Comply with the provisions of the following codes, Specifications and standards:
      g. "Recommended Practice for Consolidation of Concrete," ACI 309.
      k. "Recommended Practice for Evaluation of Strength Test Results of Concrete," ACI 214.
      m. "Guide to Cast-In-Place Architectural Concrete Practice," ACI 303.
      n. "Placing Concrete by Pumping Methods," ACI 304.2.

1.6 PRE-CONCRETE CONFERENCE
A. At least 21 days prior to start of concrete floor construction Contractor shall conduct a meeting to review proposed mix designs and to discuss required methods and procedures to achieve required concrete floor construction. Contractor shall send a pre-concrete conference agenda to all attendees 7 days prior to scheduled date of conference.

B. Responsible representatives of every party concerned with concrete work shall attend conference including, but not limited to; Contractor's superintendent, laboratory responsible for concrete design mix, laboratory responsible for field quality control, concrete subcontractor, ready-mix concrete producer, admixture manufacturer(s), concrete pumping contractor, rebar/P-T subcontractor(s), Owner's representative, Architect's representative and Structural Engineer.

C. Minutes of meeting shall be recorded, typed, printed, and distributed by the Contractor to all parties concerned within 5 days after the meeting.

PART 2 PRODUCTS

2.1 GENERAL

A. All products shall be extracted, harvested or recovered and manufactured from within 500 miles of Project. All reinforcing bar and steel components shall contain minimum 75% recycled content, all raw materials shall be manufactured and extracted within 500 miles of Project site and all recycled materials shall be manufactured and recovered within 500 miles of the Project site.

B. All paints, coatings, adhesives, sealants, stains, caulk, firestopping, etc. applied inside the weatherproofing systems and on site only in this specification must comply with the VOC limits in Section 01 8113. In submittal, include product data sheet or MSDS clearly showing VOC content of product in grams/Liter.

2.2 MATERIALS FOR STRUCTURAL CONCRETE

A. Portland Cement shall conform to requirements of ASTM C 150 or ASTM C 595. Only one brand of cement shall be used throughout work. Type shall be as indicated on Drawings.

B. Fine aggregate shall conform to applicable requirements of the current edition of ASTM C 33, and shall be natural bank or river sand, washed and screened, consisting of hard, durable, uncoated particles free of deleterious matter, and shall be so graded from coarse to fine, as to produce a minimum percentage of voids.

C. Representative samples from each proposed source of supply shall be submitted to testing laboratory for approval before any shipment is ordered, and all fine aggregate used shall, within reasonable limits, conform to approved samples.

D. Coarse aggregate shall conform to applicable requirements of the current edition of ASTM C 33, shall be gravel or crushed stone suitably processed, washed and screened, and shall consist of hard, durable particles without adherent coatings.

E. Concrete Admixtures: Provide admixtures produced and serviced by established, reputable manufacturers' and use in compliance with manufacturer's recommendations. Do not use admixtures which have not been incorporated and tested in accepted mixes.
   1. Air-entraining agent, conforming to ASTM C 260. Use of air entrainment and corresponding reduction in water/cement ratio shall be noted on the mix designs.
   2. Water-reducing admixtures: ASTM C 494, Type A.
   3. Set-controlling admixtures: ASTM C 494, and as follows:
      a. Type C, accelerating.
      b. Type D, water-reducing and retarding.
      c. Type E, water-reducing and accelerating.
      d. Type F, water-reducing, high-range (superplasticizer).
      e. Type G, water-reducing, high-range and retarding (superplasticizer).
f. Field service: When requested a qualified concrete technician, employed by manufacturer, shall be available to assist in proportioning concrete materials for optimum use, to advise on proper use of admixture and adjustment of concrete mix proportions to meet jobsite and climatic conditions.

g. Obtain approval of Architect, in writing, before using set-controlling admixtures.

4. Calcium chloride, thiocyanates, and admixtures containing more than 0.05% chloride ions shall not be used in concrete mix. Written certification of maximum chloride ion content in admixtures shall accompany mix design.

5. Fly ash conforming to ASTM C 618, Class C, may be used in non-architecturally exposed concrete. Carbon content may not exceed 3% by volume. When requested, certification attesting to carbon content and compliance with ASTM C 618, shall be furnished. Fly ash source shall remain the same for the duration of the project unless a change is specifically approved by the Architect. Only fly ash from western coal fired sources shall be used. Mercury content shall not exceed 5.5 ppb (0.0055 mg/L). Fly ash generated as a by-product of municipal solid waste incinerators does not qualify as a recycled-content material under LEED requirements.

F. Fibrous Reinforcement: Fibrillated polypropylene fibers, distributed uniformly throughout the mix. “Fibermesh” grade MD or equal. Type and dosage as recommended by manufacturer to control shrinkage cracking.

2.3 WATER

A. Use city water.

2.4 CURING MATERIALS

A. Material providing water retention not exceeding loss of .055 gm/cm² in 72 hours when used at a coverage of 200 square feet per gallon and tested in accordance with ASTM C 156. Selected products shall qualify as low VOC materials under LEED for New Construction requirements.

1. Curing compound shall conform to requirements of ASTM C 309, "Specifications for Liquid Membrane-Forming Compounds for Curing Concrete." Curing compound used on exposed concrete walls and columns shall be non-discoloring, fast drying and conclusively demonstrate that it does not darken or yellow with age. Curing compound for use on concrete floor surfaces to receive resilient flooring or other adherent covering or coating shall be specially formulated for such use and shall be certified by the manufacturer not to inhibit bonding qualities of flooring adhesives or coatings. Acceptable sources are: BASF/Sonneborn, W. R. Meadows, Dayton Superior, and Euclid Chemical.

2. Dissipating curing compound shall be liquid membrane-forming compound, complying with ASTM C 309, which provides an initial cure for concrete then begins to chemically break down and wear off the surface within 2 to 4 weeks. Use Euclid "Kurez DR", Dayton Superior "Rez Cure J-11, or approved equal. Use of this product shall be limited to surfaces receiving a post-cure penetrating sealer or cementitious topping.

3. Curing and sealing compound shall be an acrylic sealer equal to "Sealtight CS-309-25" by W. R. Meadows, Inc., or "Super Diamond Clear" by Euclid Chemical. Use of this product shall be limited exclusively to permanently exposed concrete surfaces not specified to receive a penetrating sealer or liquid hardener (comply with ASTM C 309). **(other products are available with more solids, lower VOC’s, or less resistance to yellowing, but these appear to be high quality non-yellowing compounds)**


2.5 FINISHING MATERIALS

A. Floor hardener shall be a penetrating liquid for subsequent (not integral) application and shall be "Lapidolith" by Sonneborn Building Products, Day-Chem Hardener (J-15) by Dayton
Superior, or approved equal. See schedule for location of floor hardener. No combination curing and hardener material will be considered in lieu of hardener material specified.

B. Surface set retardant (for washed aggregate finish) shall be water soluble, spray-applied liquid, equal to Rugaso-S, by Sika Corp.

C. Evaporation retarder (for hot weather finishing) shall be a spray-applied liquid monomolecular film, equal to "CONFILM" by BASF or "Sealtight EVAPRE" by W. R. Meadows. Product shall qualify as low VOC material under LEED requirements.

D. Abrasive aggregate shall be "Durafax" non-metallic aggregate by A. C. Horne, Inc., or "Fricex NS" by Sonneborn Building Products.

E. Sealer for architectural concrete shall be equal to "Weather Worker J-26" by Dayton Superior Corp.

F. Sealer for architectural concrete shall be a water based siloxane emulsion equal to "Weather Worker J-26-WB 10% Solids" by Dayton Superior Corp. Product shall qualify as low VOC material under LEED requirements.

2.6 MISCELLANEOUS MATERIALS

A. Waterstops at all concrete construction joints below grade shall be "SEALTIGHT" No. 6316, by W. R. Meadows Co., or equal, unless otherwise detailed on Drawings.

B. Expansion joint form filler shall be polystyrene rigid foam board of sufficient hardness to withstand the hydrostatic head of concrete.

C. Vapor retarder under mud slab, not otherwise specified, shall be 10-mil thickness polyolefin sheet conforming to ASTM E 1745, Class B or better, having a maximum permeance of 0.03 perms when tested in accordance with ASTM E 96.

D. Tape for vapor retarder seams shall be a minimum of 4" wide and shall be a type recommended by the manufacturer of the vapor retarder sheet.

E. For drilled or epoxied bolts in concrete, a manufacturer’s representative shall be present during initial installation to provide onsite training of installers. In the case of a cored hole, a wet hole or a hole deeper than 18 inches, substitute a slow cure epoxy adhesive or other appropriate product recommended by the manufacturer for the special application.

F. Field repair of galvanizing shall be done with "ZRC Zero VOC Cold Galvanizing Compound," by ZRC Chemical Products Co., Marshfield, MA. Coating shall qualify as low VOC material under LEED requirements.

G. Anchor slots to receive inserts for anchoring masonry units, cast stone, and marble to concrete shall be continuous No. 22 gauge galvanized sheet steel with dovetailed slots, complete with foam filler, equal to No. 305, made by Hohmann & Barnard, Inc., or approved equal. Slots shall be 1" wide and 1" deep.

2.7 NON-SHRINK GROUT

A. Pre-mixed, non-shrinking, non-metallic grout. Compressive strength in 28 days shall be 5000 psi minimum, but in no case less than specified strength of base concrete. Grout shall conform to ASTM C 1107, Grade B when tested at fluid consistency.
2.8 EPOXY ADHESIVE

A. Epoxy adhesive for filling cracks by injection or gravity feed shall conform to ASTM C 881 and shall qualify as low VOC materials under LEED requirements. Epoxy adhesive systems meeting the requirements above and offered by the following manufacturers are acceptable:
   1. Sika Corporation, Lyndhurst, New Jersey.
   2. Euclid Chemical Company, Cleveland, Ohio.

2.9 SAND/CEMENT GROUT

A. Sand/cement grout shall be a mixture of 1 part Type I Portland Cement and 2 ½ parts clean, natural sand, conforming to ASTM C 33. Water content shall be 5½ gallons per sack of cement, maximum.

2.10 BONDING COMPOUND

A. Two component, moisture insensitive, extended pot life epoxy bonding agent, Sikadur 32 Hi-Mod LPL, by SIKA Corp., Reziweld 1000, by W. R. Meadows, Inc., or Euco #452 by Euclid Chemical Co. Selected product shall qualify as a low VOC material under LEED requirements.

PART 3 EXECUTION

3.1 PRODUCTION OF CONCRETE

A. Concrete shall not be mixed for placing in work until mix designs and corresponding strength tests reflect that each proposed mix will develop strengths required, nor before mix design for each class of concrete has been approved by Architect for use on the project.

B. Measuring Ingredients:
   1. Ingredients for concrete shall be measured separately for each batch.
   2. Proportions of aggregates to cement shall produce concrete that works readily into corners and angles of forms and around reinforcement and inserts without excessive vibration, puddling or spading and without permitting ingredients to separate or free water to collect on surface of concrete. Combined aggregates shall be of such combination of sizes as not to produce harshness in placing or honeycombing in structure. Ratio between fine and coarse aggregates shall be as directed by testing laboratory but may be modified, when and as directed, in order to obtain a denser or more workable mix without altering ratios (between cement and combined aggregates) prescribed by the testing laboratory.
   3. Measure water to assure uniform proportions, in required quantities, throughout successive batches. Methods employed for measuring water shall be such as to permit close and positive control over ratio of water to cement and shall afford ready check by testing laboratory. Water shall be limited to minimum quantity required to produce concrete of workable consistency. Effect of cement-dispersing agent to be used shall be taken into consideration in determining amount of water to be used. Maximum quantity of water specified shall include free moisture content retained by aggregates. Accumulation of water on surface of concrete during placing shall be prevented by making appropriate adjustments to mixture.

C. Admixtures: Add to each concrete mixture shown on Drawings to require admixture a cement-dispersing agent conforming to requirements of these Specifications. Depending upon weather conditions at time of concrete placement, cement-dispersing agent may be supplemented by a set-accelerating agent to improve control of setting and, in case of hot weather concreting, to minimize surface checking. Such admixtures shall be introduced in quantities and according to methods recommended by manufacturers' of materials approved for use. Slump limits shown on Drawings shall apply AFTER inclusion of admixture, unless noted otherwise. An air-entraining agent shall be added to mix, where called for on
Drawings, in sufficient quantity to assure controlled entrainment at percentages shown on Drawings.

D. Maximum replacement of cement with fly ash shall be as follows:
   1. Piers: 45% by weight.
   2. Ground floor framing: 25% by weight
   3. Slabs on metal deck: 25% by weight

E. Mixing: Ready-mixed concrete, conforming to requirements of ASTM C 94, shall be used in lieu of concrete mixed at jobsite. Agency supplying ready-mixed concrete shall have a batching plant of sufficient capacity and adequate transportation equipment to assure continuous delivery at rate required. Frequency of deliveries to location of work must enable concrete to be placed continuously throughout any 1 pour.

F. Delivered concrete mixture shall conform to limits given on Drawings and on approved mix design for each class of concrete. When approved by laboratory inspector, water may be added to truck to adjust slump, but water content shall not exceed maximum specified water/cement ratio for mix. Concrete shall not be placed when its slump or temperature are outside limits given on Drawings and on approved mix design.

G. Mixing Time: Unless otherwise approved by laboratory inspector, discharge of concrete shall be completed within 1 1/2 hours or before drum has revolved 300 revolutions (whichever comes first) after introduction of mixing water to cement or cement to aggregates. In hot weather, reduce mixing time as required to prevent excessive stiffening of mix.

3.2 PLACING CONCRETE

A. Preparation:
   1. Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to assure a practically continuous flow of concrete at delivery end without separation of materials and all details thereof submitted to Architect for approval in advance of use of such equipment. Use of gravity-flow or aluminum chutes or conveyors for transporting concrete horizontally will not be permitted.
   2. Inserts: Give other trades and subcontractors ample notification and opportunity to install all anchors, nailers, pipes, conduits, boxes, inserts, thimbles, sleeves, frames, vents, wires, supports, or other items required to be built into concrete by provisions of Drawings or Specifications governing work of such trades and subcontractors or as may be necessary for proper execution of their work. Obtain suitable templates or instructions for installation of such items as are not required to be actually placed in forms by the affected trades or subcontractors themselves.
   3. Contractor shall provide access for delivery and sufficient equipment and manpower to rapidly place all concrete.
      a. All work shall be in accordance with the guidelines in ACI 304R, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete."
      b. Formwork shall have been completed. Snow, ice, water, and debris shall have been removed from within forms.
      c. Expansion joint material, anchors, and all embedded items shall have been positioned.
      d. Subgrades shall be sprinkled sufficiently to eliminate water loss from concrete.
      e. Concrete shall not be placed on frozen ground.
   4. Thoroughly wet all forms and contact surfaces before pouring concrete.
   5. Install anchor bolts for anchoring other materials to concrete as shown on approved shop drawings for those materials. Well in advance of concrete placement obtain bolts, templates and setting instructions from trade requiring them. Use templates to set all anchor bolts and secure in proper position before placing concrete. Stabbing in bolts will not be permitted. Anchor bolts shall be placed within the following tolerances measured after concrete placement:
      a. Spacing within bolt group 1/8"
      b. Location of bolt group (center) 1/2"
c. Rotation of bolt group  5 degrees  
d. Angle off vertical  5 degrees  
e. Bolt projection  $\pm \frac{3}{8}$"  

6. Anchor slots shall be placed in concrete surfaces to be faced with or meet cast stone, marble, brick, or other masonry. Slots in wall and beam faces shall be spaced approximately 16" on center, horizontally and shall be continuous from bottom to top of member to be faced.  

7. Precast concrete surfaces shall be soaked with water prior to pouring concrete topping slabs. Joints between precast double tee members shall be taped as required to contain topping. Tape shall not be more than 4" wide and have adequate adhesive to bond to precast during topping pour. Joints between precast hollow-core slab units shall be filled with sand/cement grout.  

8. Apply drainage matting to all vertical rock surfaces which are to serve as a form for basement wall.

B. Conveying Concrete:

1. Convey concrete from mixer to place of final deposit by methods which prevent separation or loss of ingredients. Concrete to be conveyed by pumping will require approval of Engineer for each class of concrete specified before being used. In general, it is the intent of these Specifications that architecturally exposed concrete will not be pumped.  

2. Pump priming grout must be discarded, not used in the structure.  

3. When colored concrete is to be pumped, priming slurry for hose shall be colored with specified admixture.  

4. A manufacturer's representative shall be present for consultation during placement of integrally colored concrete.  

C. Depositing Concrete:

1. General: Place concrete in reasonably uniform layers, approximately horizontal and not more than 2'-0" deep, except for columns which may be poured full-height (exercising care to avoid vertical joints or inclined planes). Piling up concrete in forms in such manner as to cause separation or loss of any of its ingredients will not be permitted. Concrete which has partially set or hardened shall not, under any circumstances, be deposited in work. Place concrete in forms as nearly in its final position as is practical to avoid rehandling. Exercise special care to prevent splashing forms or reinforcement with concrete. Remove any hardened or partially hardened concrete which has accumulated on forms or reinforcement before work proceeds. Do not place concrete on previously deposited concrete which has hardened sufficiently to cause formation of seams or planes of weakness within respective member or section, except as hereinafter specified. Do not permit concrete to drop freely distances greater than 3'-0". Where longer drops are necessary use a chute, tremie, or other approved conveyance to assist concrete into place without segregation. Do not pour concrete directly into excavations where water is standing. If place of deposit cannot be successfully pumped dry, pour through a tremie with its outlet end near bottom of the place of deposit.  

2. Vibration: As soon as concrete is deposited, thoroughly agitate it by means of mechanical vibrators and suitable hand tools; so manipulated as to work mixture well into all parts and corners of forms, and entirely around reinforcement and inserts. Mechanical vibrators shall have a minimum frequency of 8000 revolutions per minute (10,000 if architecturally exposed) and shall be operated by competent workmen. Over vibrating and use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at regular intervals, from 18" to 24" apart. At each insertion duration shall not be sufficient to cause segregation, generally from 5 to 15 seconds. A spare vibrator shall be kept at jobsite during all concrete placing operations. Do not insert vibrator into lower courses that have begun to set.  

3. Bonding: Before depositing any new concrete on or against previously deposited concrete which has partially or entirely set, surfaces of the latter shall be thoroughly roughened and cleaned of all foreign matter, scum and laitance. Forms shall be
retightened and surface of previously deposited concrete shall be slushed with water or bonding agent. Work shall be performed in such a manner as to assure complete bonding of newly poured concrete to that previously placed.

4. Construction joints: Except as otherwise specifically indicated on Drawings each footing, pier, column, beam, and slab shall be considered as a single unit of operation and all concrete for same shall be placed continuously so unit will be monolithic in construction. Should construction joints prove to be absolutely unavoidable, they shall be located at or near midpoints of spans. Additional construction joints shall not be made under any circumstances without written approval of Architect.

5. Concrete walls: Construct to heights, thicknesses, and profiles shown on Drawings. Wall surfaces which will be permanently exposed to view shall have all fins removed and all holes, voids, and honeycombed places filled.

6. Beams: Do not place concrete in any beams until concrete in supporting members has set for at least 24 hours. Construct top of all beams to camber shown on Drawings or schedule.

7. Slabs:
   a. Pour slabs with proper offsets, slopes to drains, etc., as shown or noted and finish as specified under "Finishing Concrete Slab Surfaces."
   b. All concrete slabs above ground level shall be poured to required thicknesses, as indicated or scheduled.
   c. Grade and properly recompact surface of subgrade under all concrete slabs shown to be placed on fill. All work required to be installed under slabs on fill shall be completed and approved before any concrete is poured.
   d. Outside bars of slab reinforcement, both main and temperature steel, parallel to beams or walls shall be placed no farther than ½ bar spacing away from adjacent face of such parallel member.

8. Pan joists: Such slabs shall be of respective joist spacing and thicknesses shown on Drawings. Pour slabs with proper offsets, slopes to drain, etc., as shown or noted on Drawings.

9. Concrete on metal deck:
   a. Before placing concrete on metal deck, clean surfaces to remove all dirt and debris. Use compressed air if necessary.
   b. Deck concrete shall be unloaded from hoppers or buggies uniformly, avoiding concentrations in localized areas, to prevent overstressing deck and to minimize excessive deflections.
   c. Deflection of deck and/or steel will take place when concrete is poured. Minimum thickness of concrete required must be provided and top surfaces of slabs must be constructed within specified tolerances. Where there is residual camber in steel beams, finished concrete surface shall follow camber of beams, but finished surface shall not vary by more than 1/4" from one beam to another adjacent beam, nor ½" total for length of floor. No adjustment will be made to contract price for additional concrete required because of deflection of deck or steel or due to differential camber.

10. Concrete platforms and foundations for mechanical and electrical equipment: Concrete fill shall be normal weight concrete (3000 psi). Reinforce normal weight concrete fill with #3 bars at 8" on center each way, set midway in fill. Trowel concrete topping to a dense, smooth finish. Set anchor bolts for securing mechanical or electrical equipment during pouring of normal weight concrete fill, accurately located by templates.

11. Protective slabs: Where indicated on Drawings, it shall be normal weight concrete (3000 psi minimum) with minimum thickness of 3½". Reinforce protective slabs with 6x6-W2.9xW2.9 welded wire mesh reinforcing. Finish slab as specified under Finishing Concrete Slab Surfaces "Troweled Finish."

12. Miscellaneous: Construct any and all items of concrete work required for or in connection with satisfactory completion of project whether each such item is specifically shown or referred to.

D. Weather Conditions:
1. Cold weather: All work shall conform to the requirements of ACI 306.1, Standard Specification for Cold Weather Concreting, published by the American Concrete Institute, except as modified by requirements of these Contract Documents. A cold weather concreting plan shall be established by Contractor sufficiently in advance of cold weather conditions to allow for orderly and effective implementation of the plan. Refer to ACI 306R-88 for guidelines. Submittal of plan is not required and will not be reviewed. Plan shall include, but is not limited to:
   a. Procedures for protecting subgrade from frost and accumulation of ice or snow on reinforcement or forms prior to placement.
   b. Methods for temperature protection during placement.
   c. Types of covering, insulation, housing, or heating to be provided.
   d. Curing methods to be used during and following the protection period.
   e. Use of strength accelerating admixtures.
   f. Methods for verification of in-place strength.
   g. Procedures for measuring and recording concrete temperatures.
   Temperature of concrete delivered at the jobsite shall conform to the following:
<table>
<thead>
<tr>
<th>Air Temperature</th>
<th>Concrete Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>30° to 45° F.</td>
<td>55° to 75° F.</td>
</tr>
<tr>
<td>0° to 30° F.</td>
<td>60° to 80° F.</td>
</tr>
<tr>
<td>Below 0° F.</td>
<td>65° to 85° F.</td>
</tr>
</tbody>
</table>
   Water heated to above 100° F. shall be combined with aggregates before cement is added. Cement shall not be added to water or aggregates having a temperature greater than 100° F.
   When outdoor temperature is less than 40° F., temperature of concrete shall be maintained at not less than 50° F. for required curing time. Concrete protection requirements (Section 03 3000 and minimum form stripping strength requirements (Section 03 1000 apply to determination of required curing time.

2. Hot weather: Temperature of concrete delivered at jobsite shall not exceed 95° F. Ingredients shall be cooled before mixing to prevent concrete temperature in excess of 95° F.
   a. All work shall conform to the requirements of ACI 305.1-06, Specification for Hot Weather Concreting, published by the American Concrete Institute, except as modified by requirements of these Contract Documents.
   b. Provisions shall be made for windbreaks, shading, fog spraying, sprinkling, or wet cover when necessary.
   c. Use specified evaporation retarder to prevent rapid drying of surface during finishing.

3.3 FILL FOR STEEL PAN STAIRS
   A. Mix 1 part Portland Cement, 1 part clean sand, and 2 parts crushed stone or gravel, passing a 1/4" sieve and retained on a 1/8" sieve, measured by volume and with only sufficient water to produce a dry consistency for proper placing and finishing.
   B. Place fill and reinforcement in all steel pan treads and intermediate platforms. Reinforcement shall be welded steel wire fabric, 4x4-W1.4xW1.4, extending over entire area of each tread and platform and properly supported ½" above bottom of steel pans. After sufficient hardening of concrete fill, steel trowel exposed surface to a smooth, even, dense finish.
   C. Sprinkle abrasive aggregate onto troweled concrete fill in two shakes, at rate of 1/4 pound per square foot and trowel lightly in surface.

3.4 INSTALLATION OF VAPOR RETARDER
   A. Granular fills shall be smooth. Install vapor retarder to form a continuous layer under concrete mud slab. At laps, film shall be lapped not less than 6". Seal all joints with specified tape. Carefully cut film around pipes and conduits and then apply tape around these protrusions.
3.5 INSTALLATION OF NON-SHRINK GROUT (under base plates)

A. Grout under all bearing plates immediately after setting plates, before additional load is applied. For proprietary grout materials, comply with manufacturer's instructions regarding mixing and placement. Do not dry pack.

B. Preparatory Work: Clean slab or foundation with liberal amounts of water. Remove all oil, grease and paint from areas of base plates or foundations to be grouted. Roughen slab and remove all waste materials, dirt, chips, oil, and excess water from anchor bolts, slab or foundation. Have necessary tools and materials as near area to be grouted as possible to permit rapid and continuous work with grout. Anchor all forms securely to prevent movement during placing or curing. Adequate clearance must be allowed between forms and base plates.

C. Mixing: A mechanical mixer should be used. Add only enough water to make placeable. Do not mix more grout than can be placed in 20 minutes. Under no circumstances should grout be retempered.

D. Grout Temperatures: Should be maintained at 50° - 90° F. for a period of 48 hours after placing. Care should be exercised so extremes of hot or cold temperatures are avoided.

E. Placing: As grouting procedure begins, placement and compaction should be continuous until completed. Lengths of banding strap placed in forms before placing grout will assist in compacting grout and eliminating air pockets. Strap should be worked in quick, short strokes and be removed before initial set occurs. Grout should be placed from one end or side only, to avoid excessive air entrapment and assure good compaction. Wherever possible grout bolt holes first. Do not overwork grout as this causes segregation, bleeding, and breakdown of initial set. If machines or equipment are being used nearby, consider shutting them down until grout takes final set.

3.6 FINISHING CONCRETE SLAB SURFACES

A. General: Concrete slabs shall be finished as specified below, within tolerances specified elsewhere in this Section. Dusting of slab surfaces with dry materials will not be permitted.

1. Forms shall be properly leveled, in good condition and securely anchored, including special attention to ends and transitions.
2. Bearing surfaces for straightedges, such as form edges or previously poured slabs, shall be kept clean of laitance, sand, gravel, or other foreign elements.
3. Screeds shall be maintained in good condition with straight cutting edges and where applicable, true round rolling wheels. Use of optical sighting equipment, such as lasers, is recommended for checking levelness and straightness. Do not drive guide stakes through vapor retarder. Contractor shall promptly adjust or replace equipment when test results indicate substandard work.
4. Highway straightedges are recommended for use in lieu of bullfloats for all slab placement and finishing operations.

B. Screeding: Immediately after placing, slab shall be vibrated and struck off true by double screeding to required level, at or below elevation or grade of finished slabs, as indicated on Drawings. Do not use vibrator to spread concrete. Low spots left behind shall immediately be filled with additional concrete, carefully avoiding segregation, and screeded to required elevation. When camber is shown or specified for slabs supported on formwork, screed to required camber. Fixed screed guides are recommended where specified surface tolerance exceeds FF25/FL20.

C. Floating: Immediately after screeding, before any excess moisture or bleed water is present on surface, float surface using long-handled bull floats or darbies to fill in any surface voids and slightly embed coarse aggregate.
D. Edging and jointing, where required, shall be done after bleed water is gone and before further finishing.

E. Float Finish:
   1. Locations: All concrete surfaces under:
      a. Waterproofing membrane.
      b. Setting beds for brick, mud-set tile, and mud-set pavers.
   2. Method of finishing: After concrete has stiffened sufficiently to bear a man’s weight without deep imprint and after water sheen has disappeared, surface shall be wood-floated at least twice to produce a uniform sandy texture with no coarse aggregate visible. Either hand or power machine floats are acceptable. Apply sufficient pressure to bring moisture to surface. Final finish shall be as approved by Architect.

F. Trowel Finish:
   1. Locations:
      a. Exposed concrete floors not otherwise specified.
      b. Concrete surfaces under:
         1) Carpets.
         2) Vinyl Tile.
         3) Thin-set Tile.
         4) Wood Flooring.
         5) Elastomeric Coating.
         6) Noncomposite topping slabs and terrazzo.
      c. Painted concrete floors.
      d. Roof slab to be future floor.
   2. Method of finishing: After concrete has stiffened sufficiently to permit the operation, and water sheen has disappeared, surface shall be hand or machine floated, followed immediately by steel troweling at least twice with hand trowels or machine trowels. Final troweling shall produce a smooth, dense, burnished finish and cause a ringing sound from the trowel.

G. Broom Finish:
   1. Locations:
      a. Exterior stairs, ramps, and walks.
      b. Curbs and islands.
      c. Parking and drive areas.
      d. Other locations noted on the Drawings.
   2. Method of finishing: Same method as specified for trowel finish, except after initial troweling brush concrete surfaces with soft brush or broom to texture approved by Architect. Striations shall run in direction of drainage slope, if any, unless otherwise indicated.

H. Heavy Brush Finish:
   1. Locations:
      a. Entrance/exit ramps steeper than 7 percent slope.
      b. Loading ramps.
      c. Other locations noted on the Drawings.
   2. Method of finishing: As soon as surface of concrete is sufficiently hardened to bear a man’s weight without deep imprint, it shall be wood-floated to a true plane with no coarse aggregate visible. Ramp surfaces shall then be cross jointed with a Goldblatt Groover (Model #06-314-M7) jointing tool, for entire width of ramps. Space cross joints at 6” intervals. Concrete surfaces between grooves shall be brushed with a stiff fiber brush to produce uniformly striated surfaces parallel with cross jointing. Again, cross joint grooves to clearly define these indentations. Grooved joints and brushed finished texture shall be approved by Architect.

I. Saw-cut Control Joints: After completion of finishing operations and as soon as concrete surface can support weight of a saw, cut control joints along straight lines where called for on
Drawings. Saw cutting shall be done within 4 hours after completion of finishing, but not so soon as to cause raveling of joint. Cut to depth indicated on Drawings.

### 3.7 CONCRETE FINISH MEASUREMENT AND TOLERANCES

**A.** All Floors Are Subject to Measurement for Flatness and Levelness and Shall Comply with the Following:

1. Slabs shall be flat within a tolerance of 1/4" in 10'-0" when tested with a 10'-0" free-standing straightedge. Apply straightedge to slab at 3'-0" intervals in both directions, lapping straightedge 3'-0" on areas previously checked. Low spots shall not exceed above dimension anywhere along straightedge. Flatness shall be checked the next work day after finishing.

2. Slabs shall be level within a tolerance of + 1/4" in 10'-0", + 3/8" in 20'-0", not to exceed 3/4" total variation, anywhere on floor, from elevations indicated on Drawings. Levelness shall be checked on a 10'-0" grid using a telescopic or laser level after removal of forms.

**B.** Measurement Standard: All floors are subject to measurement for flatness and levelness, according to ASTM E 1155, "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System."

**C.** Two-Tiered Measurement Standard: Each floor test section and overall floor area shall conform to two-tiered measurement standard as specified herein:

1. Minimum local value: FF/FL values represent absolute minimum surface profile that will be acceptable for any 1 test sample (line of measurements) anywhere within test area.

2. Specified overall value: FF/FL values represent minimum values acceptable for individual floor sections as well as the floor as a whole.

**D.** Floor Test Sections:

1. A floor test section is defined as smaller of the following areas:
   a. Area bounded by column and/or wall lines.
   b. Area bounded by construction and/or control joint lines.
   c. Any combination of column lines and/or control joint lines.

2. Test sample measurement lines within each test section shall be multidirectional along 2 orthogonal lines, defined by ASTM E 1155, at a spacing determined by Owner's testing agency.

3. Precise layout of each test section shall be determined by Owner's testing agency.

**E.** Concrete Floor Finish Tolerance:

1. Following values apply before removal of shores. Levelness values (F_L) do not apply to intentionally sloped or cambered areas, nor to slabs poured on metal deck or precast concrete.

   a. Exposed, vinyl and thin-set tiled floors, unless otherwise specified:
      - Overall Value: FF30/FL20
      - Minimum Local Value: FF23/FL15

   b. Floor to be covered with carpet and exposed concrete in unfinished spaces:
      - Overall Value: FF25/FL20
      - Minimum Local Value: FF17/FL15

   c. Recessed floors and roof slabs:
      - Overall Value: FF15/FL13
      - Minimum Local Value: FF13/FL10

**F.** Floor Elevation Tolerance Envelope:

1. In addition to satisfying profile tolerances, acceptable tolerance envelope for absolute elevation of any point on slab surface, with respect to elevation shown on Drawings, is as follows:

   a. Slab-on-grade construction: + 3/4".
b. Top surfaces of formed slabs measured prior to removal of supporting shores: + 3/4".

c. Top surfaces of all other slabs: + 3/4".

d. Slabs specified to slope shall have a tolerance from specified slope of 3/8" in 10'-0" at any point, up to 3/4" from theoretical elevation at any point.

G. Remedial Measures for Slab Finish Construction not Meeting Specified Tolerance:

1. Application of remedial measures specified herein are required whenever either or both of the following occur:
   a. Composite overall values of flatness or levelness of any test section or the entire floor installation measure less than specified values.
   b. Any individual test sample (line of measurements) measures less than specified absolute minimum flatness or levelness value.

2. Modification of existing surface:
   a. If, in Architect or Owner's representative opinion, all or any portion of substandard work can be repaired without sacrifice to appearance or serviceability of area, Contractor shall immediately undertake approved repair method.
   b. Contractor shall submit for review and approval a detailed work plan of proposed repair showing areas to be repaired, method of repair, and time to effect repair.
   c. Repair method(s), at sole discretion of Architect or Owner's representative, may include grinding (floor stoning), planing, retopping with specified floor leveling compound or polymer concrete, or any combination thereof.
   d. Repair work shall be performed at no additional cost to Owner and with no extension to construction schedule.

3. Removal and replacement:
   a. If, in Architect/Engineer or Owner's representative opinion, all or any portion of substandard work cannot be satisfactorily repaired without sacrifice to appearance or serviceability of area, Contractor shall immediately commence to remove and replace defective work as directed.
   b. Replacement sections may be retested for compliance at discretion of Architect/Engineer or Owner's representative.
   c. Replacement work shall be performed at no additional cost to Owner and with no extension to construction schedule.

3.8 FINISHING EXPOSED FORMED CONCRETE SURFACES

A. General: Intent of these Specifications is to provide for exposed-to-view concrete formed surfaces of such quality as to require a minimum of pointing. Exercise care in forming, mixing, and placing of concrete to assure reasonably uniform, dense surfaces, free from blemishes or defects. In the event of unsightly voids, honeycombs, etc., they shall be repaired using approved methods as soon as possible. Fins and other projections shall be neatly dressed off. Form offsets greater than 1/4" shall be ground down to a smooth plane. Holes larger than 1/4" in any dimension shall be drenched with clean water and properly patched with Portland Cement and sand mortar of color and texture to match surrounding concrete.

B. Smooth Form Finish: All exposed vertical surfaces shall have a smooth form finish free of holes, pits, form marks, fins and projections. Rub smooth immediately after form removal. Point and patch defects. Surface shall be uniformly smooth, straight, and true, ready to receive finish coating specified elsewhere.

C. Sandblasted Finish: A light sandblast shall be given to all architecturally exposed concrete surfaces. After removal of forms, remove all fins and form marks by rubbing with a carborundum stone. Apply sandblast to remove surface cement matrix and expose the aggregate. Degree of exposure, timing, abrasive material, and use of retarders shall be as approved by Architect based on a reference sample. Abraded mortar shall be continually
washed away from previously sandblasted areas to prevent staining. Finished surfaces shall be clean and uniform. When further curing is required, curing compound shall be applied after finishing. Use wet sandblasting techniques where required by code.

D. Foundation Dressing: After form removal, a rubbed finish slurry coat shall be applied to exterior foundation surfaces which will be exposed above grade. Remove fins and other projections by chipping or grinding. Thoroughly wet concrete surface, then trowel or brush on grout slurry coat consisting of one part gray portland cement to two parts fine aggregate, mixed with water to required consistency. Wood float the surface to fill all holes and form offsets, and build up to a thickness required to produce a smooth, even surface, aligning with wall finishes or setback dimensions. In hot, dry weather, grout shall be kept damp with fog spray or wet blankets during the initial curing period.

3.9 CONCRETE SURFACE REPAIRS

A. Filling Tie Rod and Bolt Holes: Holes resulting from removal of bolts or tie rods shall be solidly filled with cement grout. Holes passing entirely through concrete members shall be filled from inside face with a plunger-type grease gun or other device that forces mortar through to outside face, holding a canvas sack at exterior surface to assure complete filling. Holes which do not pass entirely through shall be filled using tools which will permit opening to be packed thoroughly full. All excess mortar at faces of filled holes shall be struck off flush with a canvas sack.

B. Patching Defective Areas: Repair and patch non-structural defective areas in formed surfaces immediately after removal of forms and in unformed surfaces as soon as defect is discovered. Where reinforcing steel is left exposed and at severe honeycombs, cracks, voids or other defects which may impair structural capacity, notify Architect and submit proposed repair method before attempting repairs. Non-shrink grout or epoxy resin, installed by certified technicians, will be required at structural repairs to fully restore member strength.

1. Chip out honeycombs, spalls, air bubbles, rock pockets and other voids over 1/4" in any dimension down to solid concrete. Make edges of cuts perpendicular to concrete surface. Thoroughly clean and flush with water and brush coat area to be patched with specified bonding compound. Trowel in sand/cement grout patching mixture, solidly filling void, before bonding compound has dried. Strike off and finish flush or slightly fuller than surrounding surface.

2. For exposed-to-view surfaces blend white and gray or buff Portland Cement so that, when dry, patch will match color of surrounding surface. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Finish patch surfaces with a trowel and burlap to match texture of surrounding surface.

3. Surface defects in unformed surfaces to be repaired include cracks, crazing, scaling, bolt holes, spalls, and chips. Fill holes less than 1" diameter with sand/cement grout. Larger defective areas shall be chipped out to sound concrete using clean square perimeter cuts and filled with concrete, grout or leveling compound. Defective areas larger than 1'-0" square require Architect's approval of repair method.

4. Cure patches in same manner as adjacent surfaces.

5. Remove and replace concrete containing defects which cannot be repaired to satisfaction of Architect.

C. Filling Cored Holes: Holes left from core samples and unused penetrations shall be filled solid with nonshrink grout. Flush out hole with clean water and pack grout following manufacturer's printed instructions. Where concrete surface will be exposed to view, hold nonshrink grout back 1" from surface and fill remainder with patching mixture described above.

D. Patches in architecturally exposed concrete shall be indistinguishable from surrounding surfaces. Mix formula for patching mortar shall be determined by trial, to obtain a good color match with concrete when both patch and concrete are cured and dried. After initial set,
surfaces of patches shall be dressed manually to obtain same texture as surrounding surfaces.

E. Filling Shrinkage Cracks in Floor Slabs:
   1. Fill cracks larger than 0.030" in exposed concrete floors with epoxy adhesive. Cracks shall be filled solid with material specified or approved equal. Follow manufacturer's recommendations regarding cleaning, preparation, primer, injection method and mixing. Clean or grind surface to match as closely as possible appearance of surrounding concrete.
   2. Fill, in similar manner, cracks larger than .030" in areas to receive thin-set tile or terrazzo, and cracks larger than .060" in areas to receive vinyl flooring.
   3. Fill shrinkage cracks just ahead of finish-out, after most of the concrete shrinkage has occurred.
   4. On open parking structure floors, inject all cracks larger than 0.006" with epoxy, waiting until approximately one month before project closeout.

3.10 CURING AND SEALING

A. Protect freshly placed concrete from washing by rain, flowing water, etc. Do not allow concrete to dry out from time it is deposited in forms until expiration of curing period hereinafter specified. Methods of curing shall be as specified in the following paragraphs, unless otherwise authorized by Architect.

B. Concrete surfaces, not otherwise specified, shall be cured by being kept wet with clean water for a period of not less than 7 days after placing. Each day forms are left in place and kept wet enough to prevent opening of joints in forms and drying out of concrete will be counted as 1 day of curing.

C. In lieu of wetting specified above, Contractor may use a non-bituminous liquid curing compound as specified to hold moisture in concrete. Curing liquid, if used, shall be applied in conformance with recommendations of manufacturer of material approved for use, and to sufficient extent to effectively hold moisture in concrete. Use of such material shall not relieve Contractor of responsibility of protecting all floor slabs, platforms, and steps whenever any scaffolding, shoring, form work, masonry, concrete or other work is being done over or above finished concrete slabs. Patches in architectural surfaces shall be cured for 7 days. Patches shall be protected from premature drying to same extent as mass of concrete.

D. Where called for on Drawings, specified curing and sealing compound shall be used in lieu of curing compound. Curing and sealing compound shall be limited exclusively to permanently exposed concrete surfaces which are not specified to receive penetrating sealer.

E. Apply specified penetrating sealer to exposed parking garage floors, curbs, islands, and walks after curing is complete. Apply uniformly at rate of coverage recommended by manufacturer for effective absorption, using sprayer, brush, or roller. Curing compound, if used, must be compatible with penetrating sealer. All residual curing compound shall be completely removed by water blasting or sand blasting before applying sealer.

F. Control Joint Sealant: Install specified polyurethane sealant in all tooled joints in parking deck and in joints between deck and columns, curbs, walls, beams, and floor drains and elsewhere as detailed. Thoroughly clean and prepare joints in accordance with manufacturer's instructions. Grooved control joints in traffic surface shall be abraded with grinding wheel before sealing. Apply primer as recommended by manufacturer. Protect sealant from traffic until cured.

G. Expansion Joint Traffic Seal: Clean, prepare and install complete; including nosings, traffic plates, blockout fillers, bond breakers, primers, and miscellaneous materials, as recommended by manufacturer. Protect from traffic until seal has cured.
H. Colored Concrete Floors: Apply specified curing compound in accordance with manufacturer's recommendations (2 coats minimum) and with ACI 302.1R-80, "Guide for Concrete Floor and Slab Construction."

3.11 CLEANUP

A. Imperfect or damaged work, or any material damaged or determined to be defective before final completion and acceptance of entire job, shall be satisfactorily replaced at Contractor's expense and in conformity with all of requirements of Drawings and Specifications. Removal and replacement of concrete work shall be done in such a manner as not to impair appearance or strength of structure in any way.

B. Cleaning: Upon completion of work all forms, equipment, protective coverings and any rubbish resulting therefrom shall be removed from site. After sweeping with an ordinary broom and removing all mortar, concrete droppings, loose dirt, mud, etc., wash all concrete floors and platforms with soapsuds and scrub with a stiff fiber brush. Mop up suds and flush surfaces with clean water. Provide adequate measures during scrubbing, mopping, and flushing operations to keep excessive or injurious amounts of water off resilient tile floors. Any damage to floors shall be promptly, effectively and satisfactorily repaired. Finished concrete surfaces shall be left in a clean and perfect condition, satisfactory to Owner.

3.12 CLEANING AND SEALING OF ARCHITECTURAL CONCRETE

A. Contractor shall make provisions to keep all architectural concrete free from laitance caused by spillage, leaking forms or other contaminants. In no case shall laitance be allowed to penetrate, stain, or harden on surfaces which have been treated by bush-hammering.

B. All bush-hammered surfaces shall be thoroughly cleaned before first application of sealer. All surfaces to be sealed shall be free of dirt, dust and other foreign materials prior to application of sealer.

C. Surfaces which are cleaned with a liquid cleaner shall be rinsed of all cleaning solution and allowed to dry before application of sealer. Only water or masonry cleaners approved by Architect will be used. Cleaning materials, equipment and method of performance shall be as recommended by sealer manufacturer and approved by Architect.

D. Sealer system shall have a 2 coat application. Sealer shall be applied, as recommended by manufacturer, to exposed surface as soon as possible after cleaning. Upon projects completion and immediately prior to final clean up, Contractor shall reclean surface as necessary and apply second coat of the above sealer.

E. Patching of colored concrete floors shall not be attempted without prior approval of Architect. Manufacturer's recommendations for method of matching color and bonding shall be employed.

END OF SECTION
SECTION 033001 - CAST-IN-PLACE CONCRETE – CIVIL

PART 1  GENERAL

1.01  REFERENCES
The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
AASHTO M 182 (2005; R 2009) Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats
AASHTO M 322M/M 322 (2010) Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)
ACI/MCP-1 (2013) Manual of Concrete Practice Part 1
ACI/MCP-3 (2013) Manual of Concrete Practice Part 3
ACI/MCP-4 (2013) Manual of Concrete Practice Part 4

AMERICAN HARDBOARD ASSOCIATION (AHA)
AHA A135.4 (1995; R 2004) Basic Hardboard

AMERICAN WELDING SOCIETY (AWS)
AWS D1.4/D1.4M (2011) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)
ASTM A706/A706M (2009b) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
<table>
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<tr>
<th>Reference</th>
<th>Description</th>
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<tr>
<td>ASTM A775/A775M</td>
<td>(2007b) Standard Specification for Epoxy-Coated Steel Reinforcing Bars</td>
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<tr>
<td>ASTM A996/A996M</td>
<td>(2009b) Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement</td>
</tr>
<tr>
<td>ASTM C192/C192M</td>
<td>(2012a) Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory</td>
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<td>Standard Specification</td>
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<tr>
<td>ASTM C295/C295M</td>
<td>(2012) Petrographic Examination of Aggregates for Concrete</td>
</tr>
<tr>
<td>ASTM C311/C311M</td>
<td>(2013) Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete</td>
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<tr>
<td>ASTM C567/C567M</td>
<td>(2011) Determining Density of Structural Lightweight Concrete</td>
</tr>
<tr>
<td>ASTM C618</td>
<td>(2012a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete</td>
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ASTM D1557 (2012) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2700 kN-m/m³)


ASTM E1745 (2011) Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs


CONCRETE REINFORCING STEEL INSTITUTE (CRSI)


FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001 (2000) Principles and Criteria for Forest Stewardship

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1 (2009) DOC Voluntary Product Standard PS 1-07, Structural Plywood

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 572 (1974) Corps of Engineers Specifications for Polyvinylchloride Waterstops

U.S. DEPARTMENT OF COMMERCE (DOC)

DOC/NIST PS1 (1995) Construction and Industrial Plywood with Typical APA Trademarks

U.S. GENERAL SERVICES ADMINISTRATION (GSA)
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1.02 DEFINITIONS

a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, ground granulated blast-furnace slag, and silica fume.

b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.

c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.

d. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.03 SUBMITTALS

Submit the following in accordance with Section 013300 SUBMITTAL PROCEDURES:

SD-03 Product Data

- Materials for curing concrete
- Joint sealants

Submit manufacturer's product data, indicating VOC content. Manufacturer's catalog data for the following items must include printed instructions for admixtures, bonding agents, epoxy-resin adhesive binders, and waterstops.

- Joint filler
- Plastic Forms
- Recycled Aggregate Materials
- Cement
- Portland Cement
- Ready-Mix Concrete
- Vapor retarder and Vapor barrier
- Bonding Materials
- Concrete Curing Materials
- Reinforcement
- Reinforcement Materials

SD-04 Samples

- Slab finish sample

Submit the following samples:
SD-05 Design Data

Concrete mix design

Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, pozzolans, silica fume, ground slag polypropylene fibers, and admixtures; and applicable reference specifications. Provide mix proportion data using at least three different water-cement ratios for each type of mixture, which produce a range of strength encompassing those required for each class and type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Engineer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Submit additional data regarding concrete aggregates if the source of aggregate changes. Submit copies of the fly ash, silica fume, polypropylene fibers and pozzolan test results, in addition. The approval of fly ash, silica fume, and pozzolan , and polypropylene fibers test results must be within 6 months of submittal date. Obtain acknowledgement of receipt prior to concrete placement.

Calculations

SD-06 Test Reports

Concrete mix design
Fly ash
Pozzolan
Ground granulated blast-furnace slag
Aggregates
Tolerance report
Compressive strength tests
Air Content
Slump
Air Entrainment

SD-07 Certificates

Curing concrete elements
Finishing plan
VOC Content for form release agents, curing compounds, and concrete penetrating sealers
Material Safety Data Sheets

SD-08 Manufacturer's Instructions

Fly ash
Ground granulated blast-furnace slag

Welding Procedures must be in accordance with AWS D1.4/D1.4M.
Submit mill certificates for Steel Bar according to the paragraph entitled, "Fabrication," of this section.

Provide certificates for concrete that are in accordance with the paragraph entitled, "Classification and Quality of Concrete," of this section. Provide certificates that contain project name and number, date, name of Contractor, name of concrete testing service, source of concrete aggregates, material manufacturer, brand name of manufactured materials, material name, values as specified for each material, and test results. Provide certificates for Welder Qualifications that are in accordance with the paragraph entitled, "Qualifications for Welding Work," of this section.

Welding Procedures

1.04 MODIFICATION OF REFERENCES
Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Engineer.

1.05 DELIVERY, STORAGE, AND HANDLING
Do not deliver concrete until vapor retarder, vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. ACI/MCP-2 for job site storage of materials. Protect materials from contaminants such as grease, oil, and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.

A. Reinforcement
Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.06 QUALITY ASSURANCE
A. Design Data
NOT USED

B. Drawings
1. Shop Drawings
NOT USED

2. Formwork
NOT USED

3. Reinforcing Steel
ACI/MCP-4. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars.

C. Control Submittals
1. Curing Concrete Elements
Submit proposed materials and methods for curing concrete elements.

2. Pumping Concrete
Submit proposed materials and methods for pumping concrete. Submittal must include mix designs, pumping equipment including type of pump and size and material for pipe, and maximum length and height concrete is to be pumped.

3. Silica Fume Manufacturer's Representative
Provide statement that the manufacturer's representative must be present at mix plant to ensure proper mix, including high range water reducer, and batching methods during the first 3 days of concrete mix preparation and placement. After which the manufacturer's representative must designate a representative at the concrete producer's plant to ensure the
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4. Finishing Plan
   NOT USED

5. Form Removal Schedule
   NOT USED

6. VOC Content for form release agents, curing compounds, and concrete penetrating sealers
   NOT USED

7. Material Safety Data Sheets
   Submit Material Safety Data Sheets (MSDS) for all materials that are regulated for hazardous health effects. Prominently post the MSDS at the construction site.

D. Test Reports
   1. Concrete Mix Design
      Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix must be suitable for the job conditions. Include mill test and all other test for cement, silica fume, aggregates, and admixtures in the laboratory test reports. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Submit test reports along with the concrete mix design. Obtain approval before concrete placement.

   2. Fly Ash and Pozzolan
      Submit test results in accordance with ASTM C618 for fly ash and pozzolan. Submit test results performed within 6 months of submittal date. Submit manufacturer's policy statement on fly ash use in concrete.

   3. Ground Granulated Blast-Furnace Slag
      NOT USED

   4. Aggregates
      ASTM C1260 for potential alkali-silica reactions, ASTM C295/C295M for petrographic analysis. An approved list of material suppliers can be found on the TxDOT website.

   5. Fiber-Reinforced Concrete
      Test to determine flexural toughness index I5 in accordance with ASTM C1116/C1116M.

E. Field Samples
   1. Slab Finish Sample
      NOT USED

F. Special Finisher Qualifications
   NOT USED

1.07 ENVIRONMENTAL REQUIREMENTS

Provide space ventilation according to manufacturer recommendations, at a minimum, during and following installation of concrete curing compound and sealer. Maintain one of the following ventilation conditions during the curing compound/sealer curing period or for 72 hours after installation:

a. Supply 100 percent outside air 24 hours a day.

b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 84 degrees F and humidity is between 30 percent and 60 percent.

c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.
A. Submittals for Environmental Performance
   a. Provide data indicating the percentage of post-industrial pozzolan (fly ash, blast furnace slag) cement substitution as a percentage of the full product composite by weight.
   b. Provide data indicating the percentage of post-industrial and post-consumer recycled content aggregate.
   c. Provide product data indicating the percentage of post-consumer recycled steel content in each type of steel reinforcement as a percentage of the full product composite by weight.
   d. Provide product data stating the location where all products were manufactured.
   e. For projects using FSC certified formwork, provide chain-of-custody documentation for all certified wood products.
   f. For projects using reusable formwork, provide data showing how formwork is reused.
   g. Provide MSDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.
   h. Provide MSDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

1.08 SUSTAINABLE DESIGN REQUIREMENTS
NOT USED

1.09 QUALIFICATIONS FOR CONCRETE TESTING SERVICE
Perform concrete testing by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency must meet the requirements of ASTM E329.

1.10 QUALIFICATIONS FOR WELDING WORK
Welding procedures must be in accordance with AWS D1.4/D1.4M.

Verify that Welder qualifications are in accordance with AWS D1.4/D1.4M or under an equivalent qualification test approved in advance. Welders are permitted to do only the type of welding for which each is specifically qualified.

1.11 CONCRETE SAMPLING AND TESTING
Testing by the Contractor must include sampling and testing concrete materials proposed for use in the work and testing the design mix for each class of concrete. Perform quality control testing during construction.

Sample and test concrete aggregate materials proposed for use in the work in accordance with ASTM C33/C33M.

Sample and test portland cement in accordance with ASTM C150/C150M.

Sample and test air-entraining admixtures in accordance with ASTM C233/C233M.

Testing must be performed by a Grade I Testing Technician.

PART 2 PRODUCTS

2.01 MATERIALS FOR FORMS
Provide wood, plywood, plastic, carton, or steel. Use plywood or steel forms where a smooth form finish is required.

   A. Wood Forms
   Use lumber as specified in Section 061000 ROUGH CARPENTRY and as follows. Provide lumber that is square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Provide plywood that complies with DOC/NIST PS1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining. Virgin wood used must be FSC-certified.
1. Concrete Form Plywood (Standard Rough)
   Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2. Overlaid Concrete Form Plywood (Standard Smooth)
   Provide plywood that conforms to NIST PS 1, B-B, high density form overlay, not less than 5/8-inch thick.

B. Plastic Forms
   Plastic lumber as specified in Section 061000 ROUGH CARPENTRY. Provide plastic forms that contain a minimum of 50 percent post-consumer recycled content, or a minimum of 50 percent post-industrial recycled content.

C. Carton Forms
   NOT USED

D. Steel Forms
   Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.02 FORM TIES AND ACCESSORIES
   The use of wire alone is prohibited. Provide form ties and accessories that do not reduce the effective cover of the reinforcement.

A. Polyvinylchloride Waterstops
   COE CRD-C 572.

B. Dovetail Anchor Slot
   Preformed metal slot approximately 1 by 1 inch of not less than 22 gage galvanized steel cast in concrete. Coordinate actual size and throat opening with dovetail anchors and provide with removable filler material.

2.03 CONCRETE

A. Contractor-Furnished Mix Design
   ACI/MCP-1, ACI/MCP-2, and ACI/MCP-3 except as otherwise specified. Indicate the compressive strength (f’c) of the concrete for each portion of the structure(s) and as specified below.

<table>
<thead>
<tr>
<th>Location</th>
<th>f’c (Min. 28-Day Comp. Strength) (psi)</th>
<th>ASTM C 33 Maximum Nominal Aggregate (Size No.)</th>
<th>Range of Slump (inches)</th>
<th>Maximum Water – Cement Ratio (by Weight)</th>
<th>Air Entrainment (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete exposed to weather</td>
<td>4000</td>
<td>57</td>
<td>5</td>
<td>0.50</td>
<td>4</td>
</tr>
</tbody>
</table>

Maximum slump shown above may be increased 1 inch for methods of consolidation other than vibration. Slump may be increased to 8 inches when superplasticizers are used. Provide air entrainment using air-entaining admixture. Provide air entrainment within plus or minus 1.5 percent of the value specified. Note (a): Entrapped air must be 3 percent or less.

Proportion concrete mixes for strength at 28 days.

1. Mix Proportions for Normal Weight Concrete
   Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified are the responsibility of the Contractor. Base mixture proportions on compressive strength as determined by test specimens fabricated in accordance with ASTM C192/C192M and tested in accordance with ASTM C39/C39M. Samples of all materials used in mixture proportioning studies must be representative of those proposed for use in the project and must be accompanied by the manufacturer’s or producer’s
test report indicating compliance with these specifications. Base trial mixtures having proportions, consistencies, and air content suitable for the work on methodology described in ACI/MCP-1. In the trial mixture, use at least three different water-cement ratios for each type of mixture, which must produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratio required must be based on equivalent water-cement ratio calculations as determined by the conversion from the weight ratio of water to cement plus pozzolan, by weight equivalency method. Design laboratory trial mixture for maximum permitted slump and air content. Each combination of material proposed for use must have separate trial mixture, except for accelerator or retarder use can be provided without separate trial mixture. Report the temperature of concrete in each trial batch. For each water-cement ratio, at least three test cylinders for each test age must be made and cured in accordance with ASTM C192/C192M and tested in accordance with ASTM C39/C39M for 7 and 28 days. From these results, plot a curve showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, plot a curve showing the relationship between 7 and 28 day strengths.

2. Lightweight Concrete Proportion

NOT USED

3. Required Average Strength of Mix Design

The selected mixture must produce an average compressive strength exceeding the specified strength by the amount indicated in ACI/MCP-2. When a concrete production facility has a record of at least 15 consecutive tests, the standard deviation must be calculated and the required average compressive strength must be determined in accordance with ACI/MCP-2. When a concrete production facility does not have a suitable record of tests to establish a standard deviation, the required average strength must follow ACI/MCP-2 requirements.

B. Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C94/C94M.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C94/C94M:

- Type and brand cement
- Cement content in 95-pound bags per cubic yard of concrete
- Maximum size of aggregate
- Amount and brand name of admixtures
- Total water content expressed by water/cement ratio

C. Concrete Curing Materials

1. Absorptive Cover

Provide burlap, cotton mats, and other absorbent materials for curing concrete, as described in ACI 308R.

2. Moisture-Retaining Cover

Provide waterproof paper cover for curing concrete conforming to ASTM C171, regular or white, or polyethylene sheeting conforming to ASTM C171, or polyethylene-coated burlap consisting of a laminate of burlap and a white opaque polyethylene film permanently bonded to the burlap; burlap must conform to ASTM C171, Class 3, and polyethylene film must conform to ASTM C171. When tested for water retention in accordance with ASTM C156, weight of water lost 72 hours after application of moisture retaining covering material must not exceed 0.039 gram per square centimeter of the mortar specimen surface.

3. Membrane-Forming Curing Compound

Provide liquid type compound conforming to ASTM C309, Type 1, clear, Type 1D with fugitive dye for interior work and Type 2, white, pigmented for exterior work.
CAST IN PLACE CONCRETE - CIVIL

2.04 MATERIALS

A. Cement
ASTM C150/C150M, Type I or II blended cement except as modified herein. Provide blended cement that consists of a mixture of ASTM C150/C150M, Type II, cement and one of the following materials: ASTM C618 pozzolan or fly ash. For portland cement manufactured in a kiln fueled by hazardous waste, maintain a record of source for each batch. Supplier must certify that no hazardous waste is used in the fuel mix or raw materials. For exposed concrete, use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan. An approved list of material suppliers can be found on the TxDOT website.

1. Fly Ash and Pozzolan
ASTM C618, Type N, F, or C, except that the maximum allowable loss on ignition must be 6 percent for Types N and F. Add with cement. Fly ash content must be a minimum of 15 percent by weight of cementitious material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level, provide the maximum amount of fly ash permissible that meets the code requirements for cement content. Report the chemical analysis of the fly ash in accordance with ASTM C311/C311M. Classify fly ash in accordance with ASTM D5759. An approved list of material suppliers can be found on the TxDOT website.

High contents of supplementary cementitious materials can have some detrimental effects on the concrete properties, such as slowing excessively the strength gain rate, and delaying and increasing the difficulty of finishing. The recommended maximum content (by weight of the total cementitious material) for these materials are:

1. For fly ash or natural pozzolan: 25 percent
2. For silica fume: 10 percent

B. Water
Minimize the amount of water in the mix. The amount of water must not exceed 45 percent by weight of cementitious materials (cement plus pozzolans), and in general, improve workability by adjusting the grading rather than by adding water. Water must be fresh, clean, and potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.

C. Aggregates
ASTM C33/C33M, except as modified herein. Furnish aggregates for exposed concrete surfaces from one source. Provide aggregates that do not contain any substance which may be deleteriously reactive with the alkalis in the cement.

Fine and coarse aggregates must show expansions less than 0.08 percent at 16 days after casting when testing in accordance with ASTM C1260. Should the test data indicate an expansion of 0.08 percent or greater, reject the aggregate(s) or perform additional testing using ASTM C1567 using the Contractor's proposed mix design. In this case, include the mix design low alkali portland cement and one of the following supplementary cementitious materials:

1. Fly ash or natural pozzolan at a minimum of total cementitious of
   a. 30 percent if (SiO2 plus Al2O3 plus Fe2O3) is 65 percent or more,
   b. 25 percent if (SiO2 plus Al2O3 plus Fe2O3) is 70 percent or more,
c. 20 percent if \((\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3)\) is 80 percent or more,  
d. 15 percent if \((\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3)\) is 90 percent or more.

2. Silica fume at a minimum of 7 percent of total cementitious.

If a combination of these materials is chosen, the minimum amount must be a linear combination of the minimum amounts above. Include these materials in sufficient proportion to show less than 0.08 percent expansion at 16 days after casting when tested in accordance with ASTM C1567.

Aggregates must not possess properties or constituents that are known to have specific unfavorable effects in concrete when tested in accordance with ASTM C295/C295M.

D. Nonshrink Grout  
ASTM C1107/C1107M.

E. Admixtures  
ASTM C494/C494M: Type A, water reducing; Type B, retarding; Type C, accelerating; Type D, water-reducing and retarding; and Type E, water-reducing and accelerating admixture. Do not use calcium chloride admixtures. An approved list of material suppliers can be found on the TxDOT website.

1. Air-Entraining  
ASTM C260/C260M.

2. High Range Water Reducer (HRWR) (Superplasticizers)  
ASTM C494/C494M, Type F and Type G (HRWR retarding admixture) and ASTM C1017/C1017M. Silica fume and HRWR must come from the same manufacturer.

3. Pozzolan  
Provide fly ash or other pozzolans used as admixtures that conform to ASTM C618.

F. Vapor Retarder and Vapor Barrier  
NOT USED

G. Materials for Curing Concrete  
Consider the use of water based or vegetable or soy based curing agents in lieu of petroleum based products. Consider agents that are not toxic and emit low or no Volatile Organic Compounds (VOC). Consider the use of admixtures that offer high performance to increase durability of the finish product but also have low toxicity and are made from bio-based materials such as soy, and emit low levels of Volatile Organic Compounds (VOC). An approved list of material suppliers can be found on the TxDOT website.

1. Impervious Sheeting  
ASTM C171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.

2. Pervious Sheeting  
AASHTO M 182.

3. Liquid Membrane-Forming Compound  
ASTM C309, white-pigmented, Type 2, Class B.

H. Liquid Chemical Sealer-Hardener Compound  
NOT USED

I. Expansion/Contraction Joint Filler  
ASTM D1751, ASTM D1752, cork or 100 percent post-consumer paper meeting ASTM D1752 (subparagraphs 5.1 to 5.4). Material must be 1/2 inch thick, unless otherwise indicated.

1. Preformed Joint Filler Strips  
Provide nonextruding and resilient bituminous type filler strips conforming to ASTM D1751.
J. Joint Sealants
   1. Horizontal Surfaces, 3 Percent Slope, Maximum ASTM D6690 or ASTM C920, Type M, Class 25, Use T. ASTM D7116 for surfaces subjected to jet fuel.
   2. Vertical Surfaces Greater Than 3 Percent Slope ASTM C920, Type M, Grade NS, Class 25, Use T.
   3. Waterstops Provide waterstops that are flat dumbbell type, not less than 3/16 inch for widths up to 5 inches, and not less than 3/8 inch for widths 5 inches and over.
      Provide waterstops made of rubber and that conform to ASTM D1752.
      Provide waterstops made of polyvinylchloride (PVC) and that conform to ASTM C990.
      Provide cold-applied, two-component, elastomeric polymer type compound conforming to FS SS-S-200.

K. Epoxy Bonding Compound
   ASTM C881/C881M. Provide Type I for bonding hardened concrete to hardened concrete; Type II for bonding freshly mixed concrete to hardened concrete; and Type III as a binder in epoxy mortar or concrete, or for use in bonding skid-resistant materials to hardened concrete. Provide Grade 1 or 2 for horizontal surfaces and Grade 3 for vertical surfaces. Provide Class A if placement temperature is below 40 degrees F; Class B if placement temperature is between 40 and 60 degrees F; or Class C if placement temperature is above 60 degrees F.

L. Biodegradable Form Release Agent
   Provide form release agent that is colorless, biodegradable, and water-based, with a low (maximum of 55 grams/liter (g/l)) VOC content. A minimum of 85 percent of the total product must be biobased material. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces. Provide form release agent that does not contain diesel fuel, petroleum-based lubricating oils, waxes, or kerosene.

2.05 REINFORCEMENT

A. Reinforcing Bars
   ACI/MCP-2 unless otherwise specified. ASTM A615/A615M and AASHTO M 322M/M 322 with the bars marked A, S, W, Grade 40; or ASTM A996/A996M with the bars marked R, Grade 60, or marked A, Grade 60. Provide reinforcing bars that contain a minimum of 50 percent recycled content.
   1. Galvanized Reinforcing Bars
      Provide galvanized reinforcing bars that conform to ASTM A767/A767M, Class II with galvanizing before fabrication.
   2. Weldable Reinforcing Bars
      Provide weldable reinforcing bars that conform to ASTM A706/A706M and ASTM A615/A615M and Supplement S1, Grade 60, except that the maximum carbon content must be 0.55 percent.
   3. Epoxy-Coated Reinforcing Bars
      Provide epoxy-coated reinforcing bars that conform to ASTM A775/A775M, Grade 40 or Grade 60.

B. Mechanical Reinforcing Bar Connectors
   NOT USED

C. Wire
   ASTM A82/A82M or ASTM A496/A496M.
1. Welded Wire Fabric
   ASTM A185/A185M or ASTM A497/A497M. Provide fabric that contains a minimum of 50 percent recycled content. Provide flat sheets of welded wire fabric for slabs and toppings.

2. Steel Wire
   Wire must conform to ASTM A82/A82M.

D. Reinforcing Bar Supports
   Provide bar ties and supports of coated or non-corrodible material. Use recycled plastic with 100 percent recycled content.

E. Fiber-Reinforced Concrete
   NOT USED

F. Chairs and Bolsters:
   Minimum 5 percent post-consumer recycled content, or minimum 20 percent post-industrial recycled content. Plastic and steel may contain post-consumer or post-industrial recycled content.

G. Dowels for Load Transfer in Floors
   NOT USED

H. Supports for Reinforcement
   Supports include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening reinforcing bars and wire fabric in place.

   Provide wire bar type supports conforming to ACI/MCP-3, ACI/MCP-4 and CRSI 10MSP.

   Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.

2.06 BONDING MATERIALS

A. Concrete Bonding Agent
   Provide aqueous-phase, film-forming, nonoxidizing, freeze and thaw-resistant compound agent suitable for brush or spray application conforming to ASTM C932.

B. Epoxy-Resin Adhesive Binder
   Provide two-component, epoxy-polysulfide polymer type binder with an amine-type curing-agent conforming to ASTM C881/C881M.

2.07 FLOOR FINISH MATERIALS
   NOT USED

2.08 CLASSIFICATION AND QUALITY OF CONCRETE

A. Concrete Classes and Usage
   Provide concrete classes, compressive strength, requirements for air entrainment, and usage as follows:

<table>
<thead>
<tr>
<th>CONCRETE CLASS</th>
<th>MIN. 28-DAY COMPRRESSIVE STRENGTH POUNDS PER SQ. IN.</th>
<th>REQUIREMENT FOR AIR ENTRAINMENT</th>
<th>USAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### B. Limits for Concrete Proportions

Provide limits for maximum water/cement ratio and minimum cement content for each concrete class as follows:

<table>
<thead>
<tr>
<th>CONCRETE CLASS</th>
<th>MAX. WATER/CEMENT RATIO BY WEIGHT</th>
<th>MIN. CEMENT FOR 3- TO 4-INCH SLUMP, (NO. OF 94-POUND SACKS) PER CU. YD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5A</td>
<td>0.58</td>
<td>4.75</td>
</tr>
<tr>
<td>2.5N</td>
<td>0.62</td>
<td>4.75</td>
</tr>
<tr>
<td>CONCRETE CLASS</td>
<td>MAX. WATER/CEMENT RATIO BY WEIGHT</td>
<td>MIN. CEMENT FOR 3- TO 4-INCH SLUMP, (NO. OF 94-POUND SACKS) PER CU. YD.</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>3A</td>
<td>0.50</td>
<td>5.25</td>
</tr>
<tr>
<td>3N</td>
<td>0.54</td>
<td>5.25</td>
</tr>
<tr>
<td>4A</td>
<td>0.46</td>
<td>6.0</td>
</tr>
<tr>
<td>4N</td>
<td>0.48</td>
<td>6.0</td>
</tr>
<tr>
<td>5A</td>
<td>0.41</td>
<td>6.5</td>
</tr>
<tr>
<td>5N</td>
<td>0.44</td>
<td>6.5</td>
</tr>
</tbody>
</table>

* Weight of water to weight of cement in pounds in one cubic yard of concrete.

C. Maximum Size of Aggregate
Size of aggregate, designated by the sieve size on which maximum amount of retained coarse aggregate is 5 to 10 percent by weight, must be as follows:

<table>
<thead>
<tr>
<th>MAXIMUM SIZE OF AGGREGATE</th>
<th>ASTM C33/C33M SIZE NUMBER</th>
<th>TYPE OF CONSTRUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 inches</td>
<td>357</td>
<td>Nonreinforced footings and other flat work having a depth of not less than 6 inches, and nonreinforced walls and other formed sections having a dimension between forms of not less than 10 inches</td>
</tr>
<tr>
<td>1-1/2 inches</td>
<td>467</td>
<td>Monolithic slabs on ground, concrete fill, and other flatwork having a depth of not less than 5 inches and a clear distance between reinforcing bars of not less than 2 inches</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>67</td>
<td>Reinforced walls, columns, girders, beams, and other formed sections having a dimension between forms of not less than 6 inches and clear distance between reinforcing bars or reinforcing bar and face of form of not less than 1 inch</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>67</td>
<td>Monolithic concrete slabs and other flatwork having a depth of not less than 2-1/2 inches and a clear distance between reinforcing bars of not less than 1 inch</td>
</tr>
<tr>
<td>1/2 inch</td>
<td>7</td>
<td>Concrete joist construction, beams, reinforced walls, and other formed work having a clear distance between reinforcing bars and face of form of less than 1 inch</td>
</tr>
<tr>
<td>3/8 inch</td>
<td>8</td>
<td>Nonreinforced slabs and other flatwork having a depth of less than 2-1/2 inches</td>
</tr>
</tbody>
</table>
Maximum size of aggregate may be that required for most critical type of construction using that concrete class.

D. Slump
Provide slump for concrete at time and in location of placement as follows:

<table>
<thead>
<tr>
<th>TYPE OF CONSTRUCTION</th>
<th>SLUMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Footings, unreinforced walls</td>
<td>Not less than 1 inch nor more than 3 inches</td>
</tr>
<tr>
<td>Columns, beams, reinforced walls, monolithic slabs</td>
<td>Not less than 1 inch nor more than 4 inches</td>
</tr>
<tr>
<td>Ramps and other sloping surfaces</td>
<td>0 nor more than 3 inches</td>
</tr>
</tbody>
</table>

E. Total Air Content
Air content of exposed concrete and interior concrete must be in accordance with ASTM C260/C260M and/or as follows:

<table>
<thead>
<tr>
<th>LIMITS OF CONCRETE EXPOSURE</th>
<th>REQUIREMENT FOR AIR ENTRAINMENT</th>
<th>MAXIMUM SIZE OF AGGREGATE</th>
<th>TOTAL AIR CONTENT BY VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposed to freezing and thawing or subjected to hydraulic pressure</td>
<td>Air-entrained</td>
<td>1-1/2 or 2 inches</td>
<td>3 to 5 percent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3/4 inch</td>
<td>3 to 5 percent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/2 or 3/8 inch</td>
<td>3 to 5 percent</td>
</tr>
</tbody>
</table>

Provide concrete exposed to freezing and thawing or subjected to hydraulic pressure that is air-entrained by addition of approved air-entraining admixture to concrete mix.

PART 3 EXECUTION

3.01 EXAMINATION
Do not begin installation until substrates have been properly constructed; verify that substrates are plumb and true.

If substrate preparation is the responsibility of another installer, notify Architect/Engineer of unsatisfactory preparation before processing.

Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Architect/Engineer and wait for instructions before beginning installation.

3.02 PREPARATION
Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

A. General
Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.

Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.
B. Subgrade Under Foundations and Footings
When subgrade material is semiporous and dry, sprinkle subgrade surface with water as required to eliminate suction at the time concrete is deposited. When subgrade material is porous, seal subgrade surface by covering surface with specified vapor retarder; this may also be used over semiporous, dry subgrade material instead of water sprinkling.

C. Subgrade Under Slabs on Ground
Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.

Previously constructed subgrade or fill must be cleaned of foreign materials and inspected by the Contractor for adequate compaction and surface tolerances as specified.

Actual density of top 12 inches of subgrade soil material-in-place must not be less than the following percentages of maximum density of same soil material compacted at optimum moisture content in accordance with ASTM D1557.

<table>
<thead>
<tr>
<th>SOIL MATERIAL</th>
<th>PERCENT MAXIMUM DENSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capillary water barrier</td>
<td>100</td>
</tr>
<tr>
<td>Cohesionless soil material</td>
<td>100</td>
</tr>
<tr>
<td>Cohesive soil material</td>
<td>95</td>
</tr>
</tbody>
</table>

Finish surface of capillary water barrier under interior slabs on ground must not show deviation in excess of 1/4 inch when tested with a 10-foot straightedge parallel with and at right angles to building lines.

Finished surface of subgrade or fill under exterior slabs on ground must not be more than 0.02-foot above or 0.10-foot below elevation indicated.

Prepare subgrade or fill surface under exterior slabs on ground as specified for subgrade under foundations and footings.

D. Formwork
Complete and approve formwork. Remove debris and foreign material from interior of forms before start of concrete placing.

E. Edge Forms and Screed Strips for Slabs
Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

F. Reinforcement and Other Embedded Items
Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.

3.03 FORMS
ACI/MCP-2. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Provide formwork with clean-out openings to permit inspection and removal of debris. Forms submerged in water must be watertight.
A. General
Construct forms to conform, within the tolerances specified, to shapes dimensions, lines, elevations, and positions of cast-in-place concrete members as indicated. Forms must be supported, braced, and maintained sufficiently rigid to prevent deformation under load.

B. Design and Construction of Formwork
Provide formwork design and construction that conforms to ACI/MCP-2, Chapter 4.

Provide forms that are tight to prevent leakage of cement paste during concrete placing.

Support form facing materials by structural members spaced close to prevent deflection of form facing material. Fit forms placed in successive units for continuous surfaces to accurate alignment to ensure a smooth completed surface within the tolerances specified. Where necessary to maintain the tolerances specified, such as long spans where immediate supports are not possible, camber formwork for anticipated deflections in formwork due to weight and pressure of fresh concrete and to construction loads.

Chamfer exposed joints, edges, and external corners a minimum of 3/4 inch by moldings placed in corners of column, beam, and wall forms.

Provide shores and struts with a positive means of adjustment capable of taking up formwork settlement during concrete placing operations. Obtain adjustment with wedges or jacks or a combination thereof. When adequate foundations for shores and struts cannot be secured, provide trussed supports.

Provide temporary openings in wall forms, column forms, and at other points where necessary to permit inspection and to facilitate cleaning.

Provide forms that are readily removable without impact, shock, or damage to concrete.

C. Coating
Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.

D. Reshoring
Reshore concrete elements where forms are removed prior to the specified time period. Do not permit elements to deflect or accept loads during form stripping or reshoring. Forms on columns, walls, or other load-bearing members may be stripped after 2 days if loads are not applied to the members. After forms are removed, reshore slabs and beams over 10 feet in span and cantilevers over 4 feet for the remainder of the specified time period in accordance with paragraph entitled "Removal of Forms." Perform reshoring operations to prevent subjecting concrete members to overloads, eccentric loading, or reverse bending. Provide reshoring elements with the same load-carrying capabilities as original shoring and spaced similar to original shoring. Firmly secure and brace reshoring elements to provide solid bearing and support.

E. Reuse
Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised.

F. Forms for Standard Rough Form Finish
Give rough form finish concrete formed surfaces that are to be concealed by other construction, unless otherwise specified.

Form facing material for standard rough form finish must be the specified concrete form plywood or other approved form facing material that produces concrete surfaces equivalent in smoothness and appearance to that produced by new concrete form plywood panels.

For concrete surfaces exposed only to the ground, undressed, square-edge, 1-inch nominal thickness lumber may be used. Provide horizontal joints that are level and vertical joints that are plumb.
G. Forms for Standard Smooth Form Finish
   Give smooth form finish concrete formed surfaces that are to be exposed to view or that are to be
   covered with coating material applied directly to concrete or with covering material bonded to
   concrete, such as waterproofing, dampproofing, painting, or other similar coating system.

   Form facing material for standard smooth finish must be the specified overlaid concrete form
   plywood or other approved form facing material that is nonreactive with concrete and that produce
   concrete surfaces equivalent in smoothness and appearance to that produced by new overlaid
   concrete form plywood panels.

   Maximum deflection of form facing material between supports and maximum deflection of form
   supports such as studs and wales must not exceed 0.0025 times the span.

   Provide arrangement of form facing sheets that are orderly and symmetrical, and sheets that are in
   sizes as large as practical.

   Arrange panels to make a symmetrical pattern of joints. Horizontal and vertical joints must be solidly
   backed and butted tight to prevent leakage and fins.

H. Form Ties
   Provide ties that are factory fabricated metal, adjustable in length, removable or snap-off type that do
   allow form deflection or do not spall concrete upon removal. Portion of form ties remaining within
   concrete after removal of exterior parts must be at least 1-1/2 inches back from concrete surface.
   Provide form ties that are free of devices that leave a hole larger than 7/8 inch or less than 1/2 inch
   in diameter in concrete surface. Form ties fabricated at the project site or wire ties of any type are
   not acceptable.

I. Forms for Concrete Pan Joist Construction
   NOT USED

J. Tolerances for Form Construction
   Construct formwork to ensure that after removal of forms and prior to patching and finishing of
   formed surfaces, provide concrete surfaces in accordance with tolerances specified in ACI/MCP-1
   and ACI/MCP-2.

K. Removal of Forms and Supports
   After placing concrete, forms must remain in place for the time periods specified in ACI/MCP-4. Do
   not remove forms and shores (except those used for slabs on grade and slip forms) until the client
   determines that the concrete has gained sufficient strength to support its weight and superimposed
   loads. Base such determination on compliance with one of the following:

   a. The plans and specifications stipulate conditions for removal of forms and shores, and such
      conditions have been followed, or

   b. The concrete has been properly tested with an appropriate ASTM standard test method designed
      to indicate the concrete compressive strength, and the test results indicate that the concrete
      has gained sufficient strength to support its weight and superimposed loads.

   Prevent concrete damage during form removal. Clean all forms immediately after removal.

   1. Special Requirements for Reduced Time Period
      Forms may be removed earlier than specified if ASTM C39/C39M test results of field-cured
      samples from a representative portion of the structure indicate that the concrete has reached a
      minimum of 85 percent of the design strength.

3.04 WATERSTOP SPLICES
   Fusion weld in the field.
FORMED SURFACES

A. Preparation of Form Surfaces
Coat contact surfaces of forms with form-coating compound before reinforcement is placed. Provide a commercial formulation form-coating compound that does not bond with, stain, nor adversely affect concrete surfaces and impair subsequent treatment of concrete surfaces that entails bonding or adhesion nor impede wetting of surfaces to be cured with water or curing compounds. Do not allow excess form-coating compound to stand in puddles in the forms nor to come in contact with concrete against which fresh concrete is placed. Make thinning of form-coating compound with thinning agent of the type, in the amount, and under the conditions recommended by form-coating compound manufacturer's printed or written directions.

B. Tolerances
ACI/MCP-4 and as indicated.

C. As-Cast Form
Provide form facing material producing a smooth, hard, uniform texture on the concrete. Arrange facing material in an orderly and symmetrical manner and keep seams to a practical minimum. Support forms as necessary to meet required tolerances. Do not use material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which can impair the texture of the concrete surface.

PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS
ACI/MCP-2. Provide bars, wire fabric, wire ties, supports, and other devices necessary to install and secure reinforcement. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.

A. General
Provide details of reinforcement that are in accordance with ACI/MCP-3 and ACI/MCP-4 and as specified.

B. Vapor Retarder and Vapor Barrier
NOT USED

C. Reinforcement Supports
Place reinforcement and secure with galvanized or non corrodible chairs, spacers, or metal hangers. For supporting reinforcement on the ground, use concrete or other non corrodible material, having a compressive strength equal to or greater than the concrete being placed. Rest epoxy-coated reinforcing bars supported from formwork on coated wire bar supports, or on bar supports made of dielectric material or other acceptable material. Coat wire bar supports with dielectric material, compatible with concrete, for a minimum distance of 2 inches from the point of contact with the epoxy-coated reinforcing bars. Reinforcing bars used as support bars must be epoxy coated. Spreader bars, where used, must be epoxy coated. Make proprietary combination bar clips and spreaders used in construction with epoxy-coated reinforcing bars corrosion resistant or coated with dielectric material. Tie epoxy-coated bars with plastic-coated tie wire; or other materials acceptable to the Engineer.

D. Epoxy Coated Reinforcing
Epoxy Coated Reinforcing must meet the requirements of ASTM A934/A934M including Appendix X2, “Guidelines for Job Site Practices” except as otherwise specified herein.

1. Epoxy Coated Reinforcing Steel Placement and Coating Repair
Carefully handle and install bars to minimize job site patching. Use the same precautions as described in paragraph for reinforcement delivery, handling, and storage when placing coated reinforcement. Do not drag bars over other bars or over abrasive surfaces. Keep bar free of dirt and grit. When possible, assemble reinforcement as tied cages prior to final placement into the forms. Support assembled cages on padded supports. It is not expected that coated bars, when in final position ready for concrete placement, are completely free of damaged areas; however, excessive nicks and scrapes which expose steel is cause for rejection. Criteria for
defects which require repair and for those that do not require repair are as indicated. Inspect for defects and provide required repairs prior to assembly. After assembly, reinspect and provide final repairs.

a. Immediately prior to application of the patching material, manually remove any rust and debonded coating from the reinforcement by suitable techniques employing devices such as wire brushes and emery paper. Exercise cars during this surface preparation so that the damaged areas are not enlarged more than necessary to accomplish the repair. Clean damaged areas of dirt, debris, oil, and similar materials prior to application of the patching material.

b. Do repair and patching in accordance with the patching material manufacturer's recommendations. These recommendations, including cure times, must be available at the job site at all times.

c. Allow adequate time for the patching materials to cure in accordance with the manufacturer's recommendation prior to concrete placement.

d. Rinse placed reinforcing bars with fresh water to remove chloride contamination prior to placing concrete.

E. Splicing
As indicated. For splices not indicated ACI/MCP-2. Do not splice at points of maximum stress. Overlap welded wire fabric the spacing of the cross wires, plus 2 inches. Repair the cut ends of hot-dipped galvanized reinforcement steel to completely coat exposed steel, ASTM A780/A780M.

F. Future Bonding
NOT USED

G. Cover
ACI/MCP-2 for minimum coverage, unless otherwise indicated.

H. Setting Miscellaneous Material
Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

I. Construction Joints
Locate joints to least impair strength. Continue reinforcement across joints unless otherwise indicated.

J. Expansion Joints and Contraction Joints
Provide expansion joint at edges of interior floor slabs on grade abutting vertical surfaces, and as indicated. Make expansion joints 1/2 inch wide unless indicated otherwise. Fill expansion joints not exposed to weather with preformed joint filler material. Completely fill joints exposed to weather with joint filler material and joint sealant. Do not extend reinforcement or other embedded metal items bonded to the concrete through any expansion joint unless an expansion sleeve is used. Provide contraction joints, either formed or saw cut or cut with a jointing tool, to the indicated depth after the surface has been finished. Complete saw joints within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

K. Fabrication
Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

Provide fabrication tolerances that are in accordance with ACI/MCP-1, ACI/MCP-2 and ACI/MCP-3.

Provide hooks and bends that are in accordance with ACI/MCP-3 and ACI/MCP-4.
Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not be permitted. Bending must be in accordance with standard approved practice and by approved machine methods.

Tolerance on nominally square-cut, reinforcing bar ends must be in accordance with ACI/MCP-3.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

Do not use reinforcement that has any of the following defects:

a. Bar lengths, depths, and bends beyond specified fabrication tolerances
b. Bends or kinks not indicated on drawings or approved shop drawings
c. Bars with reduced cross-section due to rusting or other cause

Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

L. Placing Reinforcement

Place reinforcement in accordance with ACI/MCP-3 and ACI/MCP-4.

For slabs on grade (over earth or over capillary water barrier) and for footing reinforcement, support bars or welded wire fabric on precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.

For slabs other than on grade, supports for which any portion is less than 1 inch from concrete surfaces that are exposed to view or to be painted must be of precast concrete units, plastic-coated steel, or stainless steel protected bar supports. Precast concrete units must be wedge shaped, not larger than 3-1/2 by 3-1/2 inches, and of thickness equal to that indicated for concrete protection of reinforcement. Provide precast units that have cast-in galvanized tie wire hooked for anchorage and blend with concrete surfaces after finishing is completed.

Contractor must cooperate with other trades in setting of anchor bolts, inserts, and other embedded items. Where conflicts occur between locating reinforcing and embedded items, the Contractor must notify the Engineer so that conflicts may be reconciled before placing concrete. Anchors and embedded items must be positioned and supported with appropriate accessories.

Handle epoxy-coated reinforcing bars carefully to prevent damage to the coating. Use plastic-coated tie wire and supports of a type to prevent damage to the reinforcing bars.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

Provide supports for reinforcing bars that are sufficient in number and sufficiently heavy to carry the reinforcement they support, and in accordance with ACI/MCP-3, ACI/MCP-4 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.

Equip supports on ground and similar surfaces with sand-plates.

Support welded wire fabric as required for reinforcing bars.

Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.

With the exception of temperature reinforcement, tied to main steel approximately 24 inches on center, reinforcement must be accurately placed, securely tied at intersections with 18-gage annealed wire, and held in position during placing of concrete by spacers, chairs, or other
approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to ACI/MCP-3.

Bending of reinforcing bars partially embedded in concrete is permitted only as specified in ACI/MCP-3 and ACI/MCP-4.

M. Spacing of Reinforcing Bars
Spacing must be as indicated. If not indicated, spacing must be in accordance with the ACI/MCP-3 and ACI/MCP-4.

Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to approval.

N. Concrete Protection for Reinforcement
Concrete protection must be in accordance with the ACI/MCP-3 and ACI/MCP-4.

O. Welding
Welding must be in accordance with AWS D1.4/D1.4M.

3.07 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE
ASTM C94/C94M, and ACI/MCP-2, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

A. Measuring
Make measurements at intervals as specified in paragraphs entitled “Sampling” and “Testing.”

B. Mixing
ASTM C94/C94M and ACI/MCP-2. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 84 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 84 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that both the specified maximum slump and water-cement ratio are not exceeded. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture to bring the entrained air content within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.

C. Transporting
Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.08 PLACING CONCRETE
Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other. Position grade stakes on 10 foot centers maximum in each direction when pouring interior slabs and on 20 foot centers maximum for exterior slabs.

A. General Placing Requirements
Deposit concrete continuously or in layers of such thickness that no concrete is placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as specified.
Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic. Deposit concrete as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation.

Concrete to receive other construction must be screeded to proper level to avoid excessive skimming or grouting.

Do not use concrete which becomes nonplastic and unworkable or does not meet quality control limits as specified or has been contaminated by foreign materials. Use of retempered concrete is permitted. Remove rejected concrete from the site.

B. Footing Placement
Concrete for footings may be placed in excavations without forms upon inspection and approval by the Engineer. Excavation width must be a minimum of 4 inches greater than indicated.

C. Vibration
ACI/MCP-2. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory elements submerged to a minimum frequency of not less than 6000 impulses per minute when submerged. Do not use vibrators to transport the concrete in the forms. Penetrate the previously placed lift with the vibrator when more than one lift is required. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete.

D. Application of Epoxy Bonding Compound
Apply a thin coat of compound to dry, clean surfaces. Scrub compound into the surface with a stiff-bristle brush. Place concrete while compound is stringy. Do not permit compound to harden prior to concrete placement. Follow manufacturer’s instructions regarding safety and health precautions when working with epoxy resins.

E. Pumping
ACI/MCP-2. Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed 2 inches. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of coarse aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well-rounded aggregate to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

1. Pumping Lightweight Concrete
ACI/MCP-1. Presoak or presaturate aggregates. Cement content must be minimum of 564 pounds per cubic yard and be sufficient to accommodate a 4 to 6 inch slump. Make field trial run in accordance with ACI/MCP-1.

F. Cold Weather
ACI/MCP-2. Do not allow concrete temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 37 degrees F in any 1 hour and 50 degrees F per 24 hours after heat application.

G. Hot Weather
Maintain required concrete temperature using Figure 2.1.5 in ACI/MCP-2 to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period.
Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

H. Follow-up
Check concrete within 24 hours of placement for flatness, levelness, and other specified tolerances. Adjust formwork and placement techniques on subsequent pours to achieve specified tolerances.

I. Placing Concrete in Forms
Deposit concrete placed in forms in horizontal layers not exceeding 24 inches.

Remove temporary spreaders in forms when concrete placing has reached elevation of spreaders.

Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Provide vibrating equipment adequate in number of units and power of each unit to properly consolidate concrete. Do not use vibrators to transport concrete inside forms.

Insert and withdraw vibrators vertically at uniformly spaced points not farther apart than visible effectiveness of machine. Do not insert vibrator into lower courses of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of concrete mix.

Do not start placing of concrete in supporting elements until concrete previously placed in columns and walls is no longer plastic and has been in place a minimum of 2 hours.

J. Placing Concrete Slabs
Place and consolidate concrete for slabs in a continuous operation, within the limits of approved construction joints until placing of panel or section is completed.

During concrete placing operations, consolidate concrete by mechanical vibrating equipment so that concrete is worked around reinforcement and other embedded items and into corners. Consolidate concrete placed in beams and girders of supported slabs and against bulkheads of slabs on ground by mechanical vibrators as specified. Consolidate concrete in remainder of slabs by vibrating bridge screeds, roller pipe screeds, or other approved method. Limit consolidation operations to time necessary to obtain consolidation of concrete without bringing an excess of fine aggregate to the surface. Concrete to be consolidated must be as dry as practical and surfaces thereof must not be manipulated prior to finishing operations. Bring concrete correct level with a straightedge and struck-off. Use bull floats or darbies to smooth surface, leaving it free of humps or hollows. Sprinkling of water on plastic surface is not permitted.

Provide finish of slabs as specified.

K. Bonding
Surfaces of set concrete at joints, except where bonding is obtained by use of concrete bonding agent, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.

At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.
Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

Bonding of fresh concrete to concrete that has set may be obtained by use of a concrete bonding agent. Apply such bonding material to cleaned concrete surface in accordance with approved printed instructions of bonding material manufacturer.

3.09 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES
NOT USED

3.10 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION
NOT USED

3.11 CURING AND PROTECTION
ACI/MCP-2 unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating. Allow curing compound/sealer installations to cure prior to the installation of materials that adsorb VOCs.

A. General
Protect freshly placed concrete from premature drying and cold or hot temperature and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of cement and proper hardening of concrete.

Start initial curing as soon as free water has disappeared from surface of concrete after placing and finishing. Keep concrete moist for minimum 72 hours.

Final curing must immediately follow initial curing and before concrete has dried. Continue final curing until cumulative number of hours or fraction thereof (not necessarily consecutive) during which temperature of air in contact with the concrete is above 50 degrees F has totaled 168 hours. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, final curing may be terminated when the average compressive strength has reached 70 percent of the 28-day design compressive strength. Prevent rapid drying at end of final curing period.

B. Moist Curing
Remove water without erosion or damage to the structure. Prevent water run-off.

1. Ponding or Immersion
Continually immerse the concrete throughout the curing period. Water must not be more than 50 degrees F less than the temperature of the concrete. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

2. Fog Spraying or Sprinkling
Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3. Pervious Sheeting
Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Provide sheeting that is at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.
4. Impervious Sheeting
   Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover
   with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete
   surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches
   wider than the concrete surface to be cured. Secure edges and transverse laps to form closed
   joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns,
   walls, and other vertical structural elements from the top down with impervious sheeting;
   overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire
   surface prior to completely enclosing.

C. Liquid Membrane-Forming Curing Compound
   Seal or cover joint openings prior to application of curing compound. Prevent curing compound from
   entering the joint. Apply in accordance with the recommendations of the manufacturer immediately
   after any water sheen which may develop after finishing has disappeared from the concrete surface.
   Provide and maintain compound on the concrete surface throughout the curing period. Do not use
   this method of curing where the use of Figure 2.1.5 in ACI/MCP-2 indicates that hot weather
   conditions cause an evaporation rate exceeding 0.2 pound of water per square foot per hour.

   1. Application
      Unless the manufacturer recommends otherwise, apply compound immediately after the
      surface loses its water sheen and has a dull appearance, and before joints are sawed.
      Mechanically agitate curing compound thoroughly during use. Use approved power-spraying
      equipment to uniformly apply two coats of compound in a continuous operation. The total
      coverage for the two coats must be 200 square feet maximum per gallon of undiluted
      compound unless otherwise recommended by the manufacturer's written instructions. The
      compound must form a uniform, continuous, coherent film that does not check, crack, or peel.
      Immediately apply an additional coat of compound to areas where the film is defective. Re-
      spray concrete surfaces subjected to rainfall within 3 hours after the curing compound
      application.

   2. Protection of Treated Surfaces
      Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after
      compound application. Maintain continuity of the coating for the entire curing period and
      immediately repair any damage.

D. Liquid Chemical Sealer-Hardener
   Apply sealer-hardener to interior floors not receiving floor covering and floors located under access
   flooring. Apply the sealer-hardener in accordance with manufacturer's recommendations. Seal or
   cover joints and openings in which joint sealant is to be applied as required by the joint sealant
   manufacturer. Do not apply the sealer hardener until the concrete has been moist cured and has
   aged for a minimum of 30 days. Apply a minimum of two coats of sealer-hardener.

E. Requirements for Type III, High-Early-Strength Portland Cement
   The curing periods are required to be not less than one-fourth of those specified for portland cement,
   but in no case less than 72 hours.

F. Curing Periods
   ACI/MCP-2 except 10 days for retaining walls, pavement or chimneys, 21 days for concrete that is in
   full-time or intermittent contact with seawater, salt spray, alkali soil or waters. Begin curing
   immediately after placement. Protect concrete from premature drying, excessively hot temperatures,
   and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for
   the period necessary for hydration of the cement and hardening of the concrete. The materials and
   methods of curing are subject to approval by the Engineer.

G. Curing Methods
   Accomplish curing by moist curing, by moisture-retaining cover curing, by membrane curing, and by
   combinations thereof, as specified.

   Moist curing:
Accomplish moisture curing by any of the following methods:

Keeping surface of concrete wet by covering with water

Continuous water spraying

Covering concrete surface with specified absorptive cover for curing concrete saturated with water and keeping absorptive cover wet by water spraying or intermittent hosing. Place absorptive cover to provide coverage of concrete surfaces and edges with a slight overlap over adjacent absorptive covers.

Moisture-cover curing:

Accomplish moisture-retaining cover curing by covering concrete surfaces with specified moisture-retaining cover for curing concrete. Place cover directly on concrete in widest practical width, with sides and ends lapped at least 3 inches. Weight cover to prevent displacement; immediately repair tears or holes appearing during curing period by patching with pressure-sensitive, waterproof tape or other approved method.

Membrane curing:

Accomplish membrane curing by applying specified membrane-forming curing compound to damp concrete surfaces as soon as moisture film has disappeared. Apply curing compound uniformly in a two-coat operation by power-spraying equipment using a spray nozzle equipped with a wind guard. Apply second coat in a direction at right angles to direction of first coat. Total coverage for two coats must be not more than 200 square feet per gallon of curing compound. Respray concrete surfaces which are subjected to heavy rainfall within 3 hours after curing compound has been applied by method and at rate specified. Maintain continuity of coating for entire curing period and immediately repair damage to coating during this period.

Membrane-curing compounds must not be used on surfaces that are to be covered with coating material applied directly to concrete or with a covering material bonded to concrete, such as other concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, painting, and other coatings and finish materials.

H. Curing Formed Surfaces
Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

I. Curing Unformed Surfaces
Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing.

Unless otherwise specified, accomplish final curing of unformed surfaces by any of curing methods specified above, as applicable.

Accomplish final curing of concrete surfaces to receive liquid floor hardener of finish flooring by moisture-retaining cover curing.

J. Temperature of Concrete During Curing
When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.
Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any 1 hour nor 80 degrees F in any 24-hour period.

K. Protection from Mechanical Injury
During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

L. Protection After Curing
Protect finished concrete surfaces from damage by construction operations.

3.12 FIELD QUALITY CONTROL

A. Sampling
ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

B. Testing
1. Slump Tests
ASTM C143/C143M. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

2. Temperature Tests
Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3. Compressive Strength Tests
ASTM C39/C39M. Make five test cylinders for each set of tests in accordance with ASTM C31/C31M. Take precautions to prevent evaporation and loss of water from the specimen. Test two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. Take samples for strength tests of each 50 CY concrete placed each day not less than once a day, nor less than once for each 160 cubic yards of concrete, nor less than once for each 5400 square feet of surface area for slabs or walls. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two cylinders from the same concrete sample tested at 28 days. If the average of any three consecutive strength test results is less than f’c or if any strength test result falls below f’c by more than 450 psi, take a minimum of three ASTM C42/C42M core samples from the in-place work represented by the low test cylinder results and test. Concrete represented by core test is considered structurally adequate if the average of three cores is equal to at least 85 percent of f’c and if no single core is less than 75 percent of f’c. Retest locations represented by erratic core strengths. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

4. Air Content
ASTM C173/C173M or ASTM C231/C231M for normal weight concrete. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

5. Strength of Concrete Structure
Compliance with the following is considered deficient if it fails to meet the requirements which control strength of structure in place, including following conditions:

Failure to meet compressive strength tests as evaluated

Reinforcement not conforming to requirements specified
Concrete which differs from required dimensions or location in such a manner as to reduce strength

Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified

Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration

Poor workmanship likely to result in deficient strength

6. Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements, make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C42/C42M, and as follows:

Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Engineer.

Test cores after moisture conditioning in accordance with ASTM C42/C42M if concrete they represent is more than superficially wet under service.

Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.

Strength of cores from each member or area are considered satisfactory if their average is equal to or greater than 85 percent of the 28-day design compressive strength of the class of concrete.

Core specimens will be taken and tested by the Government. If the results of core-boring tests indicate that the concrete as placed does not conform to the drawings and specification, the cost of such tests and restoration required must be borne by the Contractor.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Engineer.

3.13 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows.

A. Mixing Equipment

Before concrete pours, designate Company-owned site meeting environmental standards for cleaning out concrete mixing trucks. Minimize water used to wash equipment.

B. Hardened, Cured Waste Concrete

Dispose of properly.

C. Reinforcing Steel

Collect reinforcing steel and place in designated area for recycling.

D. Other Waste

Identify concrete manufacturer's or supplier's policy for collection or return of construction waste, unused material, deconstruction waste, and/or packaging material. Institute deconstruction and construction waste separation and recycling for use in manufacturer's programs. When such a program is not available, seek local recyclers to reclaim the materials.

END OF SECTION 033001
SECTION 034000 - PLANT-PRECAST CONCRETE PRODUCTS FOR BELOW GRADE CONSTRUCTION

PART 1  GENERAL

1.01  REFERENCES
The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 211.2  (1998; R 2004) Standard Practice for Selecting Proportions for Structural Lightweight Concrete
ACI 318  (2011; Errata 2011; Errata 2012) Building Code Requirements for Structural Concrete and Commentary
ACI 318M  (2011; Errata 2013) Building Code Requirements for Structural Concrete & Commentary

AMERICAN CONCRETE PIPE ASSOCIATION (ACPA)

ACPA QPC  (2005; Ver 3.0) QCast Plant Certification Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M  (2012; Errata 2011) Structural Welding Code - Steel
AWS D1.4/D1.4M  (2011) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A706/A706M (2009b) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement


ASTM A775/A775M (2007b) Standard Specification for Epoxy-Coated Steel Reinforcing Bars


ASTM C1244 (2011) Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill

ASTM C1244M (2011) Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill (Metric)

ASTM C138/C138M (2012a) Standard Test Method for Density ("Unit Weight"), Yield, and Air Content (Gravimetric) of Concrete


ASTM C192/C192M (2012a) Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory

ASTM C618 (2012a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C877 (2008) External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
ASTM C877M (2002; R 2009) External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections (Metric)
ASTM C891 (2011) Installation of Underground Precast Concrete Utility Structures

CSA STANDARDS (CSA)
1.02 SYSTEM DESCRIPTION
Furnish precast concrete units designed and fabricated by an experienced and acceptable precast concrete manufacturer who has been, for at least 3 years, regularly and continuously engaged in the manufacture of precast concrete work similar to that indicated on the drawings. Coordinate precast work with the work of other trades.

A. Standard Precast Units
Design standard precast concrete units to withstand indicated design load conditions in accordance with applicable industry design standards ACI 318, ASTM, ACPA 01-102, Chapter 7-Design for Sulfide Control. Design shall also consider stresses induced during handling, shipping and installation as to avoid product cracking or other handling damage. Indicate design loads for precast concrete units on the shop drawings. Submit drawings for standard precast concrete units furnished by the precast concrete producer for approval by the Engineer. These drawings shall demonstrate that the applicable industry design standards have been met. Include installation and construction information on shop drawings. Include details of steel reinforcement size and placement as well as supporting design calculations, if appropriate. Produce precast concrete units in accordance with the approved drawings. Submit cut sheets, for standard precast concrete units, showing conformance to project drawings and requirements, and to applicable industry design standards listed in this specification.

B. Custom-Made Precast Units
Submit design calculations for custom-made precast units, prepared and sealed by a registered professional engineer, for approval prior to fabrication. Include in the calculations the analysis of units for lifting stresses and the sizing of lifting devices. Submit drawings furnished by the precast concrete producer for approval by the Contracting Officer. Show on these drawings complete design, installation, and construction information in such detail as to enable the Engineer to determine the adequacy of the proposed units for the intended purpose. Include details of steel reinforcement size and placement as well as supporting design calculations, if appropriate. Produce precast concrete units in accordance with the approved drawings.

C. Proprietary Precast Units
Products manufactured under franchise arrangements shall conform to all the requirements specified by the franchiser. Items not included in the franchise specification, but included in this specification, shall conform to the requirements in this specification. Submit standard plans or informative literature, for proprietary precast concrete units. Make available supporting calculations and design details upon request. Provide sufficient information as to demonstrate that such products will perform the intended task.

D. Joints and Sealants
Provide joints and sealants between adjacent units of the type and configuration indicated on shop drawings meeting specified design and performance requirements.

E. Concrete Mix Design
1. Concrete Mix Proportions
   Not used

2. Concrete Strength
   Provide precast concrete units with a 28-day compressive strength (f’c) of 4000 psi.

3. Water-to-Cement Ratio
   Furnish concrete, that will be exposed to freezing and thawing, containing entrained air and with water-cement ratios of 0.45 or less. Furnish concrete which will not be exposed to freezing, but which is required to be watertight, with a water-cement ratio of 0.48 or less if the concrete is exposed to fresh water, or 0.45 or less if exposed to brackish water or sea water. Furnish
reinforced concrete exposed to deicer salts, brackish water or seawater with a water-cement ratio of 0.40 or less for corrosion protection.

4. Air Content
The air content of concrete that will be exposed to freezing conditions shall be within the limits given below.

<table>
<thead>
<tr>
<th>NOMINAL MAXIMUM AGGREGATE SIZE</th>
<th>SEVERE EXPOSURE</th>
<th>MODERATE EXPOSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 inch</td>
<td>6.0 to 9.0</td>
<td>4.5 to 7.5</td>
</tr>
<tr>
<td>1/2 inch</td>
<td>5.5 to 8.5</td>
<td>4.0 to 7.0</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>4.5 to 7.5</td>
<td>3.5 to 6.5</td>
</tr>
<tr>
<td>1.0 inch</td>
<td>4.5 to 7.5</td>
<td>3.0 to 6.0</td>
</tr>
<tr>
<td>1.5 inch</td>
<td>4.5 to 7.0</td>
<td>3.0 to 6.0</td>
</tr>
</tbody>
</table>

Note: For specified compressive strengths greater than 5000 psi, air content may be reduced 1 percent

5. Corrosion Control for Sanitary Sewer Systems
Follow design recommendations outlined in Chapter 7 of ACPA 01-102 or the ACPA 01-110 when hydrogen sulfide is indicated as a potential problem.

1.03 SUBMITTALS
All submittals are the responsibility of the precast concrete producer.

SD-02 Shop Drawings
Custom-Made Precast Units

SD-03 Product Data
Standard Precast Units
Proprietary Precast Units
Embedded Items
Accessories

SD-05 Design Data
Engineers Seal on Submittal

1.04 QUALITY ASSURANCE
Demonstrate adherence to the standards set forth in NPCA QC Manual and/or ACPA QPC. Meet requirements written in the subparagraphs below.

A. NPCA and ACPA Plant Certification
The precast concrete producer shall be certified by the National Precast Concrete Association's and/or the American Concrete Pipe Association's Plant Certification Program prior to and during production of the products for this project.

B. Qualifications, Quality Control and Inspection
1. Qualifications
Select a precast concrete producer that has been in the business of producing precast concrete units similar to those specified for a minimum of 3 years. The precast concrete producer shall maintain a permanent quality control department or retain an independent testing agency on a continuing basis.
1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery
Deliver precast units to the site in accordance with the delivery schedule to avoid excessive build-up of units in storage at the site. Upon delivery to the jobsite, all precast concrete units may be inspected by the Engineer for quality and final acceptance.

B. Storage
Store units off the ground or in a manner that will minimize potential damage.

C. Handling
Handle, transport, and store products in a manner to minimize damage. Lifting devices or holes shall be consistent with industry standards. Perform lifting with methods or devices intended for this purpose as indicated on shop drawings.

PART 2 PRODUCTS

2.01 MATERIALS
Except as otherwise specified in the following paragraphs, conform material to Section 03 30 00.00 10 CAST-IN-PLACE CONCRETE and Section 03 20 00.00 10 CONCRETE REINFORCING.

A. Cement
Furnish cement conforming to ASTM C150/C150M, Type I, II, III or V. Furnish blended cements that conform to ASTM C595/C595M.

B. Silica Fume
Provide silica fume conforming to ASTM C1240. Provide available alkalies conforming to the optimal limit given in Table 2 of ASTM C1240. Silica fume may be furnished as a dry, densified material or as a slurry. When necessary, coordinate the services of a technical representative experienced in mixing, proportioning, placement procedures, and curing of concrete containing silica fume.

C. Fly Ash and Pozzolans
Fly ash is used as a supplementary cementitious material (SCM) conforming to ASTM C618, Class C or F with 4 percent maximum loss on ignition and 35 percent maximum cement replacement by weight.

D. Ground Granulated Blast-Furnace Slag
NOT USED

E. Water
Furnish water potable or free of deleterious substances in amounts harmful to concrete or embedded metals.

F. Aggregates
1. Selection
Furnish aggregates conforming to ASTM C33/C33M. Provide aggregates not containing any substance, which may be deleteriously reactive with the alkalies in the cement.

2. Aggregates for Lightweight Concrete
ASTM C330/C330M

G. Admixtures
1. Air-Entraining
ASTM C260/C260M

2. Accelerating, Retarding, Water Reducing Moderate to High
ASTM C494/C494M

3. Pigments
Non-fading and lime-resistant
H. Reinforcement
   1. Reinforcing Bars
      a. Deformed Billet-steel: ASTM A615/A615M
      b. Deformed Low-alloy steel: ASTM A706/A706M
   2. Reinforcing Wire
      a. Plain Wire: ASTM A82/A82M
      b. Deformed Wire: ASTM A496/A496M
   3. Welded Wire Fabric
      a. Plain Wire: ASTM A185/A185M
      b. Deformed Wire: ASTM A497/A497M
   4. Epoxy Coated Reinforcement
      a. Reinforcing Bars: ASTM A775/A775M
      b. Wires and Fabric: ASTM A884/A884M
   5. Galvanized Reinforcement
      Provide galvanized reinforcement conforming to ASTM A767/A767M.

I. Synthetic Fiber Reinforcement
   Synthetic fiber shall be polypropylene with a denier less than 100 and a nominal fiber length of 2 inch.

J. Inserts and Embedded Metal
   All items embedded in concrete shall be of the type required for the intended task, and meet the following standards.
   a. Structural Steel Plates, Angles, etc.: ASTM A36/A36M
   b. Hot-dipped Galvanized: ASTM A153/A153M
   c. Proprietary Items: In accordance with manufacturers published literature

K. Accessories
   Submit proper installation instructions and relevant product data for items including, but not limited to, sealants, gaskets, connectors, steps, cable racks and other items installed before or after delivery.
   c. Preformed Flexible Joint Sealants for Concrete Pipe, Manholes, and Manufactured Box Sections: ASTM C990.
   d. Elastomeric Joint Sealants: ASTM C920

L. Pipe Entry Connectors
   Pipe entry connectors shall conform to ASTM C923 or ASTM C1478.

M. Grout
   Nonshrink Grout shall conform to ASTM C1107/C1107M. Cementitious grout shall be a mixture of portland cement, sand, and water. Proportion one part cement to approximately 2.5 parts sand, with the amount of water based on placement method. Provide air entrainment for grout exposed to the weather.

PART 3   EXECUTION

3.01 FABRICATION AND PLACEMENT
   Perform fabrication in accordance with NPCA QC Manual and/or ACPA QPC unless specified otherwise.

   A. Forms
      Use forms, for manufacturing precast concrete products, of the type and design consistent with industry standards and practices. They should be capable of consistently providing uniform products and dimensions. Construct forms so that the forces and vibrations to which the forms will be subjected can cause no product damage. Clean forms of concrete build-up after each use. Apply form release agents
according to the manufacturer’s recommendations and do not allow to build up on the form casting surfaces.

B. Reinforcement
Follow applicable ASTM Standard or ACI 318 for placement and splicing. Fabricate cages of reinforcement either by tying the bars, wires or welded wire fabric into rigid assemblies or by welding, where permissible, in accordance with AWS D1.4/D1.4M. Position reinforcing as specified by the design and so that the concrete cover conforms to requirements. The tolerance on concrete cover shall be one-third of that specified but not more than 1/2 inch. Provide concrete cover not less than 1/2 inch. Take positive means to assure that the reinforcement does not move significantly during the casting operations.

C. Embedded Items
Position embedded items at locations specified in the design documents. Perform welding in accordance with AWS D1.1/D1.1M when necessary. Hold rigidly in place inserts, plates, weldments, lifting devices and other items to be imbedded in precast concrete products so that they do not move significantly during casting operations. Submit product data sheets and proper installation instruction for anchors, lifting inserts and other devices. Clearly indicate the products dimensions and safe working load.

D. Synthetic Fiber Reinforced Concrete
Add fiber reinforcement to the concrete mix in accordance with the applicable sections of ASTM C1116/C1116M and the recommendations of the manufacturer, and in an amount of 0.1 percent by volume.

3.02 CONCRETE

A. Concrete Mixing
Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.

B. Concrete Placing
Deposit concrete into forms as near to its final location as practical. Keep the free fall of the concrete to a minimum. Consolidate concrete in such a manner that segregation of the concrete is minimized and honeycombed areas are kept to a minimum. Use vibrators to consolidate concrete with frequencies and amplitudes sufficient to produce well consolidated concrete.

1. Cold Weather Concreting
Perform cold weather concreting in accordance with ACI 306.1.
   a. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather.
   b. Free from frost all concrete materials and all reinforcement, forms, fillers, and ground with which concrete is to come in contact.
   c. Do not use frozen materials or materials containing ice.
   d. In cold weather the temperature of concrete at the time of placing shall not be below 45 degrees F. Discard concrete that freezes before its compressive strength reaches 500 psi.

2. Hot Weather Concreting
Recommendations for hot weather concreting are given in detail in ACI 305R. During hot weather, give proper attention to constituents, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure. The temperature of concrete at the time of placing shall not exceed 90 degrees F.

C. Concrete Curing
Commence curing immediately following the initial set and completion of surface finishing.

1. Curing by Moisture Retention
Prevent moisture evaporation from exposed surfaces until adequate strength for stripping is reached by one of the following methods:
a. Cover with polyethylene sheets a minimum of 6 mils thick in accordance with ASTM C171.

b. Cover with burlap or other absorptive material and keep continually moist.

c. Use of a membrane-curing compound applied at a rate not to exceed 200 square ft/gallon, or in accordance with manufacturers’ recommendations according to ASTM C309.

2. Curing with Heat and Moisture
Do not subject concrete to steam or hot air until after the concrete has attained its initial set. Apply steam, if used, within a suitable enclosure, which permits free circulation of the steam in accordance with CSA A23.4. If hot air is used for curing, take precautions to prevent moisture loss from the concrete. The temperature of the concrete shall not be permitted to exceed 150 degrees F. These requirements do not apply to products cured with steam under pressure in an autoclave.

D. Surface Finish
Finish unformed surfaces of wet-cast precast concrete products as specified. If no finishing procedure is specified, finish such surfaces using a strike-off to level the concrete with the top of the form.

1. Formed Non-Architectural Surfaces
Cast surfaces against approved forms following industry practices in cleaning forms, designing concrete mixes, placing and curing concrete. Normal color variations, form joint marks, small surface holes caused by air bubbles, and minor chips and spalls will be accepted but no major imperfections, honeycombs or other major defects will be permitted.

2. Unformed Surfaces
Finish unformed surfaces with a vibrating screed, or by hand with a float. Normal color variations, minor indentations, minor chips and spalls will be accepted but no major imperfections, honeycombs, or other major defects shall be permitted.

3. Special Finishes
Troweled, broom or other finishes shall be according to the requirements of project documents and performed in accordance with industry standards or supplier specifications. Submit finishes for approval when required by the project documents. The sample finishes shall be approved prior to the start of production.

E. Stripping Products from Forms
Do not remove products from the forms until the concrete reaches the compressive strength for stripping required by the design. If no such requirement exists, products may be removed from the forms after the final set of concrete provided that stripping damage is minimal.

F. Patching and Repair
No repair is required to formed surfaces that are relatively free of air voids and honeycombed areas, unless the surfaces are required by the design to be finished.

1. Repairing Minor Defects
Defects that will not impair the functional use or expected life of a precast concrete product may be repaired by any method that does not impair the product.

2. Repairing Honeycombed Areas
When honeycombed areas are to be repaired, remove all loose material and cut back the areas into essentially horizontal or vertical planes to a depth at which coarse aggregate particles break under chipping rather than being dislodged. Use proprietary repair materials in accordance with the manufacturer’s instructions. If a proprietary repair material is not used, saturate the area with water. Immediately prior to repair, the area should be damp, but free of excess water. Apply a cement-sand grout or an approved bonding agent to the chipped surfaces, followed immediately by consolidating an appropriate repair material into the cavity.

3. Repairing Major Defects
Evaluate, by qualified personnel, defects in precast concrete products which impair the functional use or the expected life of products to determine if repairs are feasible and, if so, to establish the repair procedure.
G. Shipping Products
Do not ship products until they are at least 5 days old, unless it can be shown that the concrete strength has reached at least 75 percent of the specified 28-day strength, or that damage will not result, impairing the performance of the product.

3.03 INSTALLATION

A. Site Access
It is the Contractor's responsibility to provide adequate access to the site to facilitate hauling, storage and proper handling of the precast concrete products.

B. General Requirements
a. Install precast concrete products to the lines and grades shown in the contract documents or otherwise specified.

b. Lift products by suitable lifting devices at points provided by the precast concrete producer.

c. Install products in accordance with the precast concrete producer's instructions. In the absence of such instructions, install underground utility structures in accordance with ASTM C891. Install pipe and manhole sections in accordance with the procedures outlined by the American Concrete Pipe Association.

d. Field modifications to the product will relieve the precast producer of liability even if such modifications result in the failure of the product.

C. Water Tightness
Where water tightness is a necessary performance characteristic of the precast concrete product's end use, watertight joints, connectors and inserts should be used to ensure the integrity of the entire system.

3.04 FIELD QUALITY CONTROL

A. Site Tests
When water tightness testing is required for an underground product, use one of the following methods:

B. Vacuum Testing
Prior to backfill vacuum test system according to ASTM C1244.

C. Water Testing
Perform water testing according to the contract documents and precast concrete producer's recommendations.

END OF SECTION 03 40 00
SECTION 04 05 23 - THROUGH-WALL FLASHING SYSTEM

PART 1 - GENERAL

1.1 GENERAL

A. Contractor shall review American Concrete Institute 530.1 mandatory specification checklist for additional requirements necessary for specific project.

B. Flashing system shall be provided and installed by a qualified waterproofing contractor.

C. Contractor shall provide a photo manifest of through-wall installation, including all starts, stops, and transitions in plane.

D. It is the intent of this specification that the new work will provide a watertight facility (restricted to the location where work is to be performed). The attached specifications describe the minimum acceptable standards of construction and finish.

1.2 QUALITY ASSURANCE

A. At a scheduled pre-construction meeting with all trades, contractor shall review flashing for the project and how the flashing shall be sequenced with the following: below grade waterproofing, air and vapor system, window installation, sealant installation, relief angles and roofing.

B. Factory Technical Representative: Contractor is to arrange and schedule the manufacturer’s technical representative to be on site the first day of the installation of manufacturer’s flashing system. The manufacturer’s technical representative shall inspect the work of the contractor at least one time each week during the course of the installation of the wall flashing system. The manufacturer’s technical representative shall perform with the owner’s representative and the contractor a final inspection of the flashing system. At the completion of the final inspection, provide to the waterproofing contractor a list of punch list items (if any) to be correct before technical acceptance of the project and prior to issuance of manufacturer’s Ten (10) Year Warranty. Field reports shall be provided after each inspection within five (5) days of site visit.

1.3 SUBMITTALS

A. Shop Drawings: Contractor shall provide from the manufacturer a review of the flashing design for the project and location of preformed shapes on reduced floor plan.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original, unopened containers and rolls with all labels intact and legible including labels indicating appropriate warnings, storage conditions, lot numbers, and usage instructions. Materials damaged in shipping or storage shall not be used.

B. Manufacturer’s packaging and/or roll plastic is not acceptable for exterior storage. Tarpaulin with grommets shall be minimum acceptable for exterior coverings. All materials stored as above shall be a minimum of four inches (4”) off the substrate, and the tarpaulin tied off with rope.

C. Deliver materials in sufficient quantity to allow continuity of work.

D. Handle and store material in such a manner as to avoid damage.

E. Protect materials against damage by construction traffic.

F. Storage: All materials should be stored under cover to avoid site damage. During cool weather construction, store materials inside at 50º F or higher.

G. The proper storage of materials is the sole responsibility of the contractor and damaged materials shall be discarded, removed from the project site, and replaced prior to application.
1.5 SITE CONDITIONS

A. Job Condition Requirements: Coordinate the work of the contractor with the work to be performed by the Owner's personnel, to ensure proper sequencing of the entire work. The contractor shall follow local, state, and federal regulations, safety standards, and codes. When a conflict exists, use the stricter document.

B. Protection of Work and Property:

1. Work: The contractor shall maintain adequate protection of all his work from damage and shall protect the Owner's and adjacent property from injury or loss arising from this contract. He shall provide and maintain at all times any OSHA required danger signs, guards, and/or obstructions necessary to protect the public and his workmen from any dangers inherent with or created by the work in progress. All federal, state, and city rules and requirements pertaining to safety and all EPA standards, OSHA standards, NESHAP regulations shall be fulfilled by the contractor as part of his proposal.

2. Property: Protect existing planting and landscaping as necessary or required to provide and maintain clearance and access to the work of this contract. Examples of two categories or degrees of protection are generally as follows: a) removal, protection, preservation, or replacement and replanting of plant materials; b) protection of plant materials in place, and replacement of any damage resulting from the contractor's operations.

C. Damage to Work of Others: The contractor shall repair, refinish, and make good any damage to the building or landscaping resulting from any of his operations. This shall include, but is not limited to, any damage to plaster, tile work, wall covering, paint, ceilings, floors, or any other finished work. Damage done to the building, equipment, or grounds shall be repaired at the successful contractor's expense holding the Owner harmless from any other claims for property damage and/or personal injury.

D. Measurements: It will be the contractor's responsibility to obtain and/or verify any necessary dimensions by visiting the job site, and the contractor shall be responsible for the correctness of same. Any drawings supplied are for reference only.

E. Cleaning and Disposal of Materials:

1. Contractor shall keep the job clean and free from all loose materials and foreign matter. Contractor shall take necessary precautions to keep outside walls clean.

2. All waste materials, rubbish, etc., shall be removed from the Owner's premises as accumulated. Rubbish shall be carefully handled to reduce the spread of dust. At completion, all work areas shall be left clean and all contractor's equipment and materials removed from the site.

3. Debris shall be deposited at an approved disposal site.

PART 2 - PRODUCTS

2.1 BUILT-IN FLASHING MEMBRANE (ELVALOY® SHEET)

A. The built-in flashing membrane shall be 40 mil flexible sheet material, consisting of a blend of elastomeric and thermal plastic polymers, incorporating DuPont® Elvaloy®. The membrane shall be reinforced with synthetic fibers, calendered into sheet form, rolled and cut to width.

B. Cloaks shall be pre-formed, three dimensional flexible units used for detail corners, level changes, stop ends, and special applications.

Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elongation</td>
<td>175%</td>
<td>ASTM D412</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>650 psi</td>
<td>ASTM D412</td>
</tr>
<tr>
<td>Tear Strength</td>
<td>280 psi</td>
<td>ASTM D624</td>
</tr>
<tr>
<td>Low Temperature Flexibility</td>
<td>-25º F Pass</td>
<td>ASTM D146</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>Less than 0.1%</td>
<td>ASTM D471</td>
</tr>
</tbody>
</table>

C. Cloak color shall be as selected by Architect and/or shall match mortar color. Reference manufacturer's list of colors for selection.
2.2 RELATED MATERIALS FOR BUILT-IN FLASHING MEMBRANE

A. Flashing Membrane Adhesive: Flashing adhesive exceeds the requirements of TTS00230C Type II, Class B, 
ASTM C 92094 and Canadian Spec CAN 19, 13M82. The product is terra cotta (dull red) in color.

<table>
<thead>
<tr>
<th>Physical Properties</th>
<th>Value</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness Shore A</td>
<td>24 ± 3</td>
<td>ASTM C 661</td>
</tr>
<tr>
<td>Shear Strength</td>
<td>75 psi</td>
<td>ASTM D 1002</td>
</tr>
<tr>
<td>Tack Free Time</td>
<td>25 minutes</td>
<td>ASTM C 679</td>
</tr>
<tr>
<td>Slump (sag)</td>
<td>Zero slump</td>
<td>ASTM C 697</td>
</tr>
<tr>
<td>Shrinkage</td>
<td>No measurable shrinkage after 14 days</td>
<td></td>
</tr>
<tr>
<td>Low Temperature Flexibility</td>
<td>-20° F pass 1/4 inch mandrel</td>
<td></td>
</tr>
<tr>
<td>Service Temperature</td>
<td>-40° F to 200° F continuous service</td>
<td></td>
</tr>
<tr>
<td>Shelf Life</td>
<td>One year</td>
<td></td>
</tr>
</tbody>
</table>

2.3 SURFACE-ADHERED WITH DRIP FLASHING MEMBRANE (ELVALOY® SHEET)

A. Surface-adhered with drip membrane shall be a composite 40 mil membrane consisting of 25 mils of elastomeric/thermal plastic membrane incorporating DuPont™ Elvaloy® and 15 mils of SBS asphaltic adhesive. The membrane shall be reinforced with synthetic fibers, calendered into sheet form, rolled and cut to standard widths.

B. Standard Sheet Dimensions: Thickness 40 mil

<table>
<thead>
<tr>
<th>Physical Properties</th>
<th>Value</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elongation</td>
<td>225%</td>
<td>ASTM D412</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>875 psi</td>
<td>ASTM D412</td>
</tr>
<tr>
<td>Tear Strength</td>
<td>270 psi</td>
<td>ASTM D624</td>
</tr>
<tr>
<td>Low Temperature Flexibility</td>
<td>-25º F Pass</td>
<td>ASTM D146</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>Less than 0.1%</td>
<td>ASTM D471</td>
</tr>
</tbody>
</table>

C. Cloaks shall be pre-formed, three dimensional flexible units used for detail corners, level changes, stop ends, and special applications.

2.4 RELATED MATERIALS FOR SURFACE ADHERED FLASHING MEMBRANE

A. Asphalt Primer: Shall be a two-sided, self-adhering tape used to seal the top of cloaks against the back-up wythe. Adhesive may be used as an alternative.

B. Primer:

<table>
<thead>
<tr>
<th>Physical Properties</th>
<th>Value</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elongation</td>
<td>&gt;656% no Breakage, Exceeded Travel of Instron</td>
<td>ASTM D 2370</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>85.1 psi</td>
<td>ASTM D 2370</td>
</tr>
<tr>
<td>pH</td>
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<tr>
<td>Hardness Shore A</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>Peel Strength</td>
<td>Aluminum No Fail at 4.60 pli</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concrete No Fail at 3.86 pli</td>
<td></td>
</tr>
</tbody>
</table>

C. Mastic: Shall be used at all laps and joints, and top terminations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances and other specific conditions.
3.2 GENERAL

A. Laying Masonry Walls: Use an inverted lintel CMU or fully grouted hollow CMU as a base for flashing at sills, floor joints, and other similar conditions.

B. Preparation: All sharp protrusions and mortar droppings must be removed from the substrate, and the surface must be clean and dry.

C. Where brick work occurs about the roof elevation, provide solid protection of the existing roof system until work is complete.

D. Flashing shall be fully supported when crossing the cavity except at sill and coping locations.

3.3 INSTALLATION OF BUILT-IN FLASHING MEMBRANE (ELVALOY® SHEET)

A. Flashing membrane and cloaks shall be installed in a bed of fresh mortar and should extend through the outer wythe a minimum of one-fourth inch (1/4") and left exposed. Flashing membrane is UV resistant.

B. Weep holes shall be provided immediately above all flashing at 24-inch centers. A minimum of two weeps shall be installed above any wall opening.

C. All joints in the flashing membrane shall be lapped a minimum of four inches (4") using flashing membrane adhesive.

D. Flashing membrane shall be installed six inches (6") above finished grade level.

E. Cloaks and end dams shall be installed at all window and door heads and sills.

F. Vertical flashing at wall openings shall extend onto the window unit a minimum of three inches (3") with one inch (1") minimum adhesion on the back of the penetration. The door/window frame shall be installed with the flashing extending onto the frame.

G. Cleaning: Flashing membrane shall not be damaged by cavity cleaning after installation. Precautions to be taken during subsequent work are:

   1. Use of cavity battens to prevent mortar droppings;

   2. Removal of droppings before they harden;

   3. Never use implements such as steel rods for cleaning the cavity; and

   4. Inspection of cavity flashing for damage as the work proceeds.

3.4 INSTALLATION OF SURFACE-ADHERED FLASHING WITH Drip MEMBRANE (ELVALOY® SHEET)

A. Priming: All flashing substrates shall be primed. Flashing primer shall be applied with a brush, roller or sprayed. Coverage is approximately 400 square feet per U.S. gallon (3.78L). Drying time may vary depending on temperature, humidity, and air movement; drying time should be approximately 45 minutes.

B. Flashing System Installation: Starting at a corner, mount cloak to substrate flashing adhesive. Cut surface adhered membrane into workable sections (8'-10'). Remove the release sheet and adhere the membrane to the inner leaf of construction lapping the membrane onto the cloak four inches (4"). Use firm hand pressure and a steel roller to totally adhere membrane in place. Extend membrane completely through the outer leaf and leave it exposed one-fourth inch (1/4") minimum. The surface-adhered membrane is UV resistant. Apply a bead of flashing mastic to all top termination edges.

C. Termination Bar: The surface-adhered membrane shall be installed using a termination bar for additional attachment to the inner leaf.

D. Weep holes shall be provided immediately above all flashing at 24-inch centers. A minimum of two baffle weeps shall be installed above any wall opening.

E. Flashing membrane shall be installed six inches (6") above finished grade level.
F. Stop end cloaks shall be installed at all windows, door heads, sills, and through-wall starts, stops, steps, etc.

G. Enveloped vertical flashing at wall openings shall extend into the wall opening one inch (1”). The door/window frame shall be installed with the flashing extending into the frame. Enveloped vertical flashing shall be installed at all abutments of dissimilar exterior wall treatments: inside and outside nineties (90°), etc.

H. Cleaning: Flashing membrane shall not be damaged by cavity cleaning after installation. Precautions to be taken during subsequent work are:

1. Use of cavity battens to prevent mortar droppings;
2. Removal of droppings before they harden;
3. Never use implements such as steel rods for cleaning the cavity; and
4. Inspection of cavity flashing for damage as the work proceeds.

3.5 FLASHING MEMBRANE ADHESIVE

A. Application:

1. Flashing adhesive shall be applied to clean, dry and relatively smooth surfaces.

2. When joint two (2) pieces of flashing membrane, or joining flashing membrane to Cloaks:
   a. Apply two (2) one-fourth inch (1/4”) beads of adhesive approximately one-half inch (1/2”) and one and one-half inch (1-1/2”), respectively, from the edge of the bottom membrane along the entire width of the bottom membrane. Overlap the top membrane over the bottom membrane two inches (2”) and roll lap with steel hand roller, causing excess to extrude the entire length of the overlap.

3. Do not remove excess adhesive.

B. Safety, Storage and Handling: Keep container tightly closed when not in use. Store at room temperature. Clean up tools and hands with waterless hand cleaner.

3.6 SUBSTRATE PRIMER

A. Surface Preparation: Areas to be primed should be dry.

B. Application: may be applied using a soft roller or brush. It can be removed from masonry with soapy water while wet and a solvent-based cleaner if dry (mineral spirits or citrus cleaner).

C. Coverage: Depending on the condition of the surface, coverage may vary from as little as 150 square feet to 200 square feet per gallon.

D. Caution:

1. Primer should not be applied when temperatures are below 40° F or when rain is imminent.
2. Keep substrate primer from freezing.
3. During hot weather, the product should be stored in a cool shaded area.
4. Do not thin this product.
5. Curing rates will vary depending on the ambient temperature relative humidity, wind speed, sky condition and the proper rate of application. Generally speaking, Substrate primer will dry within 15 to 30 minutes when applied at 70° F or above. At 50° F, on a cloudy day, cure time may be extended to as much as one hour.

6. Check several places on primed area for dryness prior to proceeding with the flashing application.

END OF SECTION 04 05 23
SECTION 042000 - UNIT MASONRY ASSEMBLIES

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 unit masonry assemblies consisting of the following:

1. Concrete masonry units.
2. Face brick.
3. Cavity-wall insulation.
4. Mortar and grout.
5. Reinforcing steel.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.

B. Related Sections include the following:

1. Division 5 Section “Metal Fabrications” for loose steel lintels.
2. Division 5 Section “Metal Fabrications” for angle extensions for masonry wire anchors.
3. Division 7 Section "Bituminous Dampproofing" for dampproofing applied to cavity face of backup wythes of cavity walls.
4. Division 7 Section “Sheet Metal Flashing, Trim and Accessories” for exposed sheet metal flashing.
5. Division 7 Section “Penetration Firestopping” for firestopping at tops of masonry walls and at openings in masonry walls.
6. Division 7 Section "Fire Resistive Joint Systems" for firestopping at tops of masonry walls and at openings in masonry walls.

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
2. Ledge Flashing Plans, Elevations, and Details: Indicate locations of vertical offsets and end dams, changes in flashing materials, and built-up or prefabricated assemblies.

C. Samples for Verification: For the following:

1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Accessories embedded in the masonry.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
E. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:

1. Each type of masonry unit required.
   a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
   b. Percent voids (ASTM C 216) for solid brick indicated to be used in fire rated wall assemblies.

2. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.

F. Material Certificates (non-load bearing walls): Include statements of material properties signed by manufacturers certifying compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Each type of masonry unit required.
   a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
   b. For exposed brick, include material test report for efflorescence according to ASTM C 67.

2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.

3. Each type and size of joint reinforcement.

4. Each type and size of anchor, tie, and metal accessory.

G. Cold-Weather Procedures: Detailed description of methods, materials and equipment to be used to comply with cold-weather requirements.

H. Cleaning Procedures: Detailed description of methods, materials, equipment and site cleanup procedures to be used. Provide with letters of approval from brick and cleaning material manufacturers regarding the compatibility of proposed use of products together for cleaning purposes.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1053 to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Preconstruction Testing Services: Provide Material Certificates in lieu of testing, unless otherwise directed by Architect. If Material Certificates are unavailable, notify the Architect immediately upon discovery. Engage a qualified independent testing agency to perform preconstruction testing indicated below if directed by the Architect. Payment for these services will be made by the Owner except in the case of retesting for substandard materials and in the case of first time testing for substandard materials where Material Certificates were submitted as part of the the Quality Control procedures for the job. Where considered appropriate by the Design Team, Prism Test shall be used where completed masonry assemblies are built with potentially substandard materials. Testing of built assemblies determined to contain substandard materials, shall be at the Contractor's expense.

1. Material Certificates (non-load bearing walls): Material Certificates proving compliance with the test below (except the Prism Test) are usually available from manufacturers. Certificates indicating compliance are acceptable to satisfy Quality Control requirements for the individual materials listed when used in masonry
assemblies. Use this method of Quality Control in lieu of Prsim Test unless total cost of Certificate acquisition is greater than the Prism Tests.

a. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
b. Mortar Test (Property Specification): For each mix required, per ASTM C 780.
c. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019 with minimum compressive strength of 2,500 psi.

2. Prism Tests (required for load bearing walls, conditionally allowed for non-load bearing walls): At the Contractors option, Prism Tests may be used to confirm non-load bearing masonry assembly compressive strength in lieu of Material Certificates, but only when the Prism Tests cost less than obtaining Material Certificates of the four tests listed above. Material Certificates indicating compliance with the tests are usually available from the material manufacturers. Submit pricing comparison to Architect. Do not proceed with Prism Tests without confirmation to proceed from the Architect.

a. Prism Test (if used): For each type of wall construction indicated, per ASTM C 1314.
b. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.
c. Fabricate brick prisms with height-to-thickness ratio of 5, unless otherwise indicated.
d. Fabricate concrete masonry prisms with height-to-thickness ratio of not less than 1.33 nor more than 3.0.

E. Preconstruction (Mockups) and Construction Water Leak Testing by the Contractor:

1. Water Leak Testing: Test masonry veneer assembly construction, including mockups, per ASTM C1715 – 09 Standard Test Method for Evaluation of Water Leakage Performance of Masonry Wall Drainage Systems. This testing shall be done in the presence of the Architect. A report of the testing activity shall be provided to the Architect. The report shall contain photos and narrative description of all the test locations and photos. The photos shall document conditions before testing begins and during testing conditions showing that the flashing successfully sheds all water. Provide three hard copies (color printed on paper – 8.5 inches x 11 inches and bound) of the report to the Architect. Provide an electronic copy in a single document, in the portable document format (PDF).

a. Exterior Perimeter Walls: Perform water leak testing at every 20,000 square feet (1,858 square m) of veneer masonry, or every 500 lineal feet (152.4 m) of exterior wall (whichever is lesser). Testing shall be performed during installation of through-wall flashing and masonry veneer. Testing shall occur in close proximity to discontinuous windows (punched, non-ribbon windows) and or door openings to provide supplementary testing of through-wall flashing at openings, and shall be a minimum of 24 inches (600 mm) above the adjacent openings. If there are no openings, testing shall occur at a minimum of 24 inches (600 mm) above the through-wall flashing.
b. High-Low Conditions: Perform water leak testing at every 30 lineal feet (9.14 m) above all through-wall flashing locations at exterior high-low wall conditions. Testing shall be performed during installation of through-wall flashing and masonry veneer. Testing shall occur in close proximity to discontinuous windows (punched, non-ribbon windows) and or door openings to provide supplementary testing of through-wall flashing at openings, and shall be a minimum of 24 inches (600 mm) above the adjacent openings. If there are no openings, testing shall occur at a minimum of 24 inches (600 mm) above the through-wall flashing.
c. Retesting: In the event of water leak testing failure, veneer masonry shall be removed down to the through-wall flashing, and appropriate repairs shall be made to ensure a water tight system. The masonry veneer assembly shall be rebuilt to a minimum of 24 inches (600 mm) above the through-wall flashing. The wall assembly shall be retested at the Contractor’s expense.

F. Concrete Masonry Unit Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

G. Brick Fire-Resistance Ratings: Where indicated, provide solid brick (ASTM C 216) or custom solid brick.

H. Mockups: Prior to installing unit masonry, construct mockups to verify selections made under Sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Mockups shall be built by the Subcontractor responsible for the Project Work. Build mockups to comply with the following requirements, using all conditions and materials indicated for the completed Work:

1. Locate mockups on-site in the locations indicated or, if not indicated, as directed by Architect.
2. Build mockups for the following types of masonry in sizes approximately 96 inches (2400 mm) long by 96 inches (2400 mm) high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches (400 mm) long in each mockup.

   a. Each type of exposed unit masonry construction.
   b. Typical exterior wall with through-wall flashing installed for a 24 inch (600 mm) length in corner of mockup approximately 16 inches (400 mm) down from top of mockup, with a 12 inch (300 mm) length of flashing left exposed to view (omit masonry above half of flashing).
   c. Typical exterior wall with window opening, framed with trim and accessories.
   d. Typical exterior masonry-veneer wall complete with metal studs, sheathing, veneer ties, flashing, and weep holes.
   e. Typical interior unit masonry walls of all types included in the Work.

3. Clean exposed faces of mockups with masonry cleaner as indicated.

4. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.

5. Notify Architect 7 days in advance of dates and times when mockups will be constructed.

6. Demonstrate the proposed range of aesthetic effects and workmanship.

7. Perform Water Leak Testing on mockup per the “Quality Assurance” Article.

8. Protect mockups from the elements with weather-resistant membrane.

9. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

10. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship. Mockups shall in all cases represent the level of workmanship to be provided, including the extent of excess mortar to be cleaned from completed masonry.

   a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.

11. When directed, demolish and remove mockups from Project site.

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

   A. Deliver materials to Project site in undamaged condition.

   B. Store and handle unit masonry and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, or other causes.

   C. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry. Store in a manner to prevent leaching of naturally occurring earth salts or other undesirable materials.

   D. Protect concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum percentage specified for the average annual relative humidity as reported by the National Weather Service official reporting station nearest the project site.

   E. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

   F. Store aggregates, covered in a dry location, where grading and other required characteristics can be maintained and contamination avoided.

   G. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.

1. When ambient temperature exceeds 100 deg F (38 deg C), or 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 – PRODUCTS

2.1 CONCRETE MASONRY UNITS

a. General: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, sash, control joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners, unless otherwise indicated.
3. Where ceramic tile is indicated as the finish material, use square-edged units for outside corners and jamb conditions.

b. Concrete Masonry Units: Provide units complying with characteristics indicated below for Grade, face size, exposed face and, under each form included, for weight classification.

1. Grade N.
   a. Size: Manufacturer's standard units with nominal face dimensions of 16 inches long x 8 inches high (15-5/8 inches x 7-5/8 inches actual) x thicknesses indicated.
   b. Cure units by autoclave treatment at a minimum temperature of 350°F (176°C) and a minimum pressure of 125 psi.
UNIT MASONRY ASSEMBLIES

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Ft. Sam Houston ISD

4. Weight Classification:
   a. Non-loadbearing: Lightweight unless otherwise indicated.
   b. Loadbearing: Refer to the Structural documents: "Reinforced Unit Masonry" specification section and drawings.

5. Decorative Units: Manufacturer's standard color and texture, unless otherwise indicated.

6. Exposed Faces: (Standard and Burnished) Manufacturer's standard color and texture, unless otherwise indicated.
   a. Where special patterns and finishes are indicated, provide manufacturer's standard color and texture, unless otherwise indicated.

2.2 BRICK

A. General: Provide shapes indicated and as follows for each form of brick required:
   1. Provide solid units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.

B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
   1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
   2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Face Brick: ASTM C 216, Grade SW, Type FBS, and as follows:
   1. Initial Rate of Absorption: Less than 20 g/30 sq. in. (20 g/194 sq. cm) per minute when tested per ASTM C 67.
   2. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
   3. Size: Manufactured to the following actual dimensions:
      a. Modular: 3-1/2 to 3-5/8 inches (89 to 92 mm) wide by 2-1/4 inches (57 mm) high by 7-1/2 to 7-5/8 inches (190 to 194 mm) long.

4. Application: Use where brick is exposed, unless otherwise indicated.
   a. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.

At both the Elementary School and Cole High School, the design intent is to match the existing masonry currently in place at the respective schools.

Contractor shall visit each school to determine the best match with the existing masonry. Initial consultation with the following Vendors/Manufacturers has been made in order to determine a good match for the existing masonry:

ELEMENTARY SCHOOL Contacts for Initial Brick selection
   1. Sam Poland
      Architectural & Commercial Sales
      Blackson Brick Southwest
      O 210.549.1036  C 210.621.4050

   2. Terry Tucker
      Acme Brick
      (210) 849-8198 Mobile
COLE HIGH SCHOOL Contacts for Initial Brick Selection
1. Terry Tucker  
   Acme Brick  
   (210) 849-8198 Mobile

5. Color and Texture: To be selected by Architect; Design intent is to match existing masonry used at each school.

D. Building (Common) Brick: ASTM C 62, Grade SW, and as follows:
   1. Application: Use where brick is indicated for concealed locations.

2.3 MORTAR AND GROUT MATERIALS

A. MASONRY CEMENT SHALL NOT BE USED.

B. Portland Cement: ASTM C 150, Type. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Aggregate for Mortar: ASTM C 144.
   1. For joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18 mm) sieve.
   2. White-Mortar Aggregates: Natural white sand or ground white stone.
   3. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

E. Aggregate for Grout: ASTM C 404.

F. Premixed cement, lime, pigment (or no pigment) and sand for mortar:
   1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include the following:
      a. Portland Cement/Lime and Sand Mortar, Spec Mix, Inc. distributed by TXI 972-647-6700 www.txi.com

G. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.
   1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
      a. True Tone Mortar Colors, Davis Colors 800-356-4848 www.daviscolors.com
      b. SGS Mortar Colors, Solomon Colors, Inc. 800-624-0261 www.solomoncolors.com

H. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for masonry wall caps (and approved for such use by manufacturer of the units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.

2.4 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60 (Grade 400).

B. Epoxy-Coated Reinforcing Steel: ASTM A 615/A 615M, Grade 60 (Grade 400); epoxy coated to comply with ASTM A 775/A 775M.
2.5 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES:

A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:

B. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

2. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 or B-3 coating as indicated.
3. Stainless-Steel Wire: ASTM A 580, Type 304 or 316.
4. Galvanized Steel Sheet: ASTM A 653, G90, commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.
6. Stainless-Steel Sheet: ASTM A 666, Type 304 or 316.
7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.6 CORROSION PROTECTION

A. Wire Ties and Anchors:

1. Completely embedded in mortar or grout: ASTM A 641, Class 3.
2. Exposed in air spaces or cavities: ASTM A 153, Class B-2.
3. Exposed to corrosive vapors, atmospheres, or elements: ASTM A 167, Type 304 or 316.

B. Sheet Steel Ties and Anchors:

1. Completely embedded in mortar or grout: ASTM A 653, G90.
2. Exposed in air spaces or cavities: ASTM A 153, Class B-2.
3. Exposed to corrosive vapors, atmospheres, or elements: ASTM A 167, Type 304 or 316.

C. Joint Reinforcement:

1. Completely embedded in mortar or grout: ASTM A 641, Class 3.
2. Exposed in air spaces or cavities: ASTM A 153, Class B-2.
3. Exposed to corrosive vapors, atmospheres, or elements: ASTM A 167, Type 304 or 316.

2.7 JOINT REINFORCEMENT

A. Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10’, with prefabricated corner and tee units, and complying with requirements indicated below:

1. Width: Fabricate joint reinforcement in units with widths of approximately 2 inches less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8 inch on joint faces exposed to exterior and 1/2 inch elsewhere.
2. Wire Size for Side Rods: 0.1483 inch diameter.
3. Wire Size for Cross Rods: 0.1483 inch diameter.
4. For single-wythe masonry provide type as follows with single pair of side rods:
   a. Truss design with continuous diagonal cross rods spaced not more than 16 inches o.c.
5. For multi-wythe masonry provide type as follows:
a. Ladder design with perpendicular cross rods spaced not more than 16 inches o.c. and number of side rods as follows:

1.) Number of Side Rods for Composite Construction: One side rod for each face shell of concrete masonry back-up and one rod for brick wythe.

2.) Number of Side Rods for Multiple-Wythe Concrete Masonry: One side rod for each face shell of concrete masonry back-up and of concrete masonry facing wythe.

3.) Number of Side Rods for Multiple-Wythe Brick Masonry: One side rod for each wythe.

2.8 BENT-WIRE TIES

A. Provide individual prefabricated bent-wire units complying with requirements indicated below:

1. Wire Size: 0.1875 inch diameter.

2. Length: Provide units of length indicated but not less than that required for embedment into each wythe of 1-1/2 inch for solid units and for embedment of tie end into face shells of hollow units, with not less than 5/8 inch mortar cover on exterior face joints, 1/2 inch elsewhere.

B. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with closed ends and not less than 4 inches wide.

C. Tie Shape for Solid Masonry Unit Construction: Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long.

1. Type: Unit ties bent from one piece of wire.

2.9 FLEXIBLE ANCHORS

A. Where flexible anchors are indicated for connecting masonry to structural framework, provide 2-piece anchors as described below which permit vertical or horizontal differential movement between wall and framework parallel to, but resist tension and compression forces perpendicular to, plane of wall.

B. For anchorage to steel framework provide manufacturer’s standard anchors with crimped 1/4 inch diameter wire anchor section for welding to steel and triangular-shaped wire tie section, for solid masonry, and rectangular-shaped wire tie section, for hollow masonry, sized to extend within 1 inch of masonry face.

1. Wire Size: 0.1875 inch diameter.

C. Where indicated or required by authorities having jurisdiction, provide manufacturer’s standard breakaway-type anchors fabricated from low-melting-point metal and designed to allow masonry assembly to release from structural framework.

1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

   a. Break-Away Firewall Anchors, Heckmann Building Products, Inc. 800-621-4140
   www.heckmannbuildingprods.com

2.10 MASONRY VENEER ANCHORS AND TIES

A. Two-piece assemblies which permit vertical or horizontal differential movement between wall and framework parallel to, but resist tension and compression forces perpendicular to, plane of wall; consisting of wire tie section and metal anchor section for attachment over sheathing to metal studs, sized to accommodate design documents, reference drawings for wall assemblies, and complying with the following requirements.

B. Wire Ties For Cold-Formed Metal Frame Stud Assemblies:

1. Wire Size: 0.1875” diameter.

2. Wire Tie Shape: Triangular.

3. Wire Tie Length: As required to extend within 1” of masonry veneer face.

C. Wire Ties For Cold-Formed Metal Frame Furring Channel Assemblies:
1. Wire Size: 0.1875" diameter.
2. Wire Tie Shape: J shaped with vertical loop-back leg as manufactured by Heckman Building Products, Inc. 800-621-4140 www.heckmannbuildingprods.com
3. Wire Tie Length: As required to extend within 1" of masonry veneer face.

D. Anchor Sections For Cold-Formed Metal Frame Stud Assemblies:
1. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches (70 mm) wide by 3 inches (75 mm) high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit anchor section.
   a. Available Products: Subject to compliance with requirements, masonry veneer anchors which may be incorporated in the work includes, but is not limited to, the following:
      1.) #HB-200X; Hohmann & Barnard, Inc (631) 234-0600 www.h-b.com
2. Anchor Section: Gasketed sheet metal plate with screw holes top and bottom; top and bottom ends bent to form pronged legs to bridge insulation or sheathing and contact studs; and raised rib-stiffened strap stamped into center to provide a slot between strap and plate for connection of wire tie.
3. Plate 1-1/4 inches (32 mm) wide by 6 inches (150 mm) long with strap 5/8 inch (16 mm) wide by 6 inches (150 mm) long; slot clearance formed between face of plate and back of strap shall not exceed diameter of wire tie by more than 1/32 inch (0.8 mm).
4. Provide anchor manufacturer's standard, self-adhering, modified bituminous gaskets manufactured to fit behind anchor plate and to prevent moisture from penetrating sheathing at pronged legs and screw holes.
   a. Available Products: Subject to compliance with requirements, masonry veneer anchors which may be incorporated in the work includes, but is not limited to, the following:
      1.) "X-Seal"; Hohmann & Barnard, Inc (631) 234-0600 www.h-b.com
5. Anchor Section: Zinc-alloy barrel section with flanged head with eye and corrosion-resistant, self-drilling screw. Eye designed to receive tie section and to serve as head for drilling fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat directly against framing with flanged head covering hole in sheathing.
6. Provide anchor manufacturer's standard, self-adhering, modified bituminous gaskets manufactured to fit behind anchor plate and to prevent moisture from penetrating sheathing at pronged legs and screw holes.
   a. Available Products: Subject to compliance with requirements, masonry veneer anchors which may be incorporated in the work includes, but is not limited to, the following:
      1.) "Pos-i-Tie"; Heckman Building Products, Inc. 800-621-4140 www.heckmannbuildingprods.com
7. Anchor Section (For Cold-Formed Metal Framing Furring Channel Assemblies): Provide POS-I-TIE by Heckman Building Products, Inc. 1-800-621-4140 www.heckmannbuildingprods.com, with a self-drilling steel fastener with 3/8" x 3/4" galvanized steel washer with a permaseal backing for 1/2: gypsum sheathing. Fastener section shall be coated twice with Stalgard, by Elco Industries 815-397-515, after initial galvanizing. The barrel casting shall be of Zamak-2 (92% zinc) with an eye at the outer end that fits over the end of the self-drilling steel fastener.

E. MASONRY VENEER ANCHORS AND TIES OVER CMU BACKUP
1. Anchor Sections For CMU Assemblies:
   a. Provide anchor manufacturer's standard Truss Style Adjustable Joint Reinforcement with Eyes and Pintles manufactured to fit in masonry joints and accommodate design documents, reference drawings for wall assemblies.
2. Available Products: Subject to compliance with requirements, masonry veneer anchors which may be incorporated in the work includes, but is not limited to, the following:
   a. #170 Lox-All Truss Adjustable Eye-Wire; Hohmann & Barnard, Inc. (631) 234-0600 www.h-b.com

2.11 METAL FASTENERS FOR STEEL STUDS
A. Steel drill screws, #10 diameter x length required to penetrate steel stud flange by not less than 3 exposed threads, complying with ASTM C 954 except with hex washer head and neoprene washer, cadmium-plated.

2.12 MISCELLANEOUS ANCHORS

A. Rigid Anchors: Provide straps of form and length indicated, fabricated from sheet metal strips of following width and thickness, unless otherwise indicated.

1. Width: 1 inch.
2. Thickness: 1/8 inch.

B. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:

2.13 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Fabricate from the following metal complying with requirements specified below:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.4 mm) thick.
2. Copper: 10 oz./sq. ft. (3 kg/sq. m) weight or 0.0135 inch (0.34 mm) thick for fully concealed flashing; 16 oz./sq. ft. (5 kg/sq. m) weight or 0.0216 inch (0.55 mm) thick elsewhere.
3. Fabricate through-wall metal flashing embedded in masonry from sheet metal indicated above.
4. Copings: unless otherwise indicated, provide through-wall metal flashing, fabricated from sheet metal indicated above, with ribs formed in dovetail pattern at 3 inch (75 mm) intervals along length of flashing to provide a three-way integral mortar bond and weep-hole drainage (ref. SMACNA Fig. 4.2c).
5. At other conditions, provide through-wall metal flashing, fabricated from sheet metal indicated above, formed to shapes indicated.
6. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.

B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:

1. Asphalt-Coated Copper Flashing: Manufacturer's standard product consisting of 5 oz./sq. ft. (1.5 kg/sq. m) sheet copper coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
2. Rubberized-Asphalt Flashing: Manufacturer's standard composite flashing product consisting of a pliable and highly adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of 0.030 inch (0.8 mm). Do not install Rubberized-Asphalt Flashing adjacent to or in contact with flexible vinyl products (PVC).

C. EPDM Flashing (Elastomeric Flashing): Manufacturer's standard flashing product formed from a terpolymer of ethylene-propylene diene, complying with ASTM D 4637, 0.040 inch (1.0 mm) thick.

D. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing, Trim and Accessories."

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

F. Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

1. Metal Flashing:
   a. Cheney Flashing (Dovetail), Cheney Flashing Company 800-322-2873 www.cheney flashing.com

2. Asphalt-Coated Copper Flashing:
   a. Cop-R-Cote, Advanced Building Products, Inc. 800-252-2306 www.advancedflashing.com
   b. Type ACC-Asphalt Bituminous Coated, Phoenix Building Products 800-825-2878
   c. Coated Copper Flashing, Sandell Manufacturing 800-283-3888 www.sandellmfg.com
d. Multi-Flash 500 Series, York Manufacturing, Inc. 800-551-2828 www.yorkmfg.com

3. Rubberized-Asphalt Flashing: Rubberized-Asphalt Flashing or Elastomeric and Thermal Plastic Polymer Flashing (embedded flashing at bottoms of walls and as additionally indicated):
   c. Cloaked Flashing System (ELVALOY® 40 mil SHEET), Hyload, Inc. 800-457-4056 www.hyloadflashing.com
   d. Polyguard 400, Polyguard Products, Inc. 800-541-4994 www.polyguardproducts.com
   e. TW Thru Wall-Flash (40 mil), Tamko Building Products, Inc. 800-641-4691 www.tamko.com

4. EPDM Flashing (Elastomeric Flashing):
   a. FlashGuard, Firestone Building Products Company 800-428-4442 www.firestonebpco.com

2.14 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.


C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Trapezoidal Cavity Drainage Material: Free-draining mesh; made from polyethylene strands; of thickness required for proper application.

   1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
      a. Mortar Break, Advanced Building Products, Inc. 800-252-2306 www.advancedflashing.com
      b. Mortar Net, Mortar Net USA Ltd. 800-664-6638 www.mortarnet.com
      c. CavClear Masonry Mat, CavClear Products, a Division of Archovations, Inc. 715-381-5773 www.cavclear.com

E. Weep Vents: Honeycomb polypropylene design to allow passage of moisture from cavity to the building. Size vents to fit head joints of brick or block being used.

   1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
      a. Quadro-Vent, Hohmann & Barnard, Inc. 800-645-0616 www.h-b.com

2. Material: Polypropylene tested in conformance with ASTM D2240, D790B, D638 and D1238B.

3. Color: Grey where uncolored mortar is used. As selected by Architect from manufacturer’s full line of colors where colored mortar is used.

F. Hardware Cloth: 18 x 18 x 0.0125 inch diameter stainless steel wire.

2.15 INSULATION

A. Thermal Resistivity: Where thermal resistivity properties of insulating materials are designated by "r-values," they represent the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a
homogeneous material exactly 1 inch thick. Thermal resistivities (r-values) are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

B. Thermal Resistance: Where thermal resistance properties of insulating materials are designated by "R-values," they represent the reciprocal of thermal conductance (C-value). Thermal conductance is the rate of heat flow through a material of thickness indicated. Thermal resistances (R-values) are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

2.16 CAVITY-WALL INSULATION

A. Extruded-Polystyrene Board Insulation: Rigid, cellular, polystyrene thermal insulation with closed cells and integral high-density skin; formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV; 25 psi insulation board, 5 year aged r-value of 5 Btu/(hr x sf x `F) at 75 degree F (24 degree C); in manufacturer's standard lengths and widths; thicknesses and R values as indicated.

1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
   a. Certifoam, DiversiFoam Products 763-477-5854 www.diversifoam.com
   c. Foamular, Owens Corning 800-438-7465 www.owenscorning.com
   d. GreenGuard Insulation Board, Pactive Corporation 800-241-4402 www.greenguard.pactive.com

B. Adhesive: Type recommended by insulation board manufacturer for application indicated.> <See Division 7 Section "Bituminous Dampproofing". Coordinate and insure compatibility of adhesive type bituminous dampproofing with insulation board manufacturer for application indicated.

2.17 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2 cup (0.14 L) dry measure tetrasodium polyphosphate and 1/2 cup (0.14 L) dry measure laundry detergent dissolved in 1 gal. (4 L) of water.

1. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry and pigmented mortar surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

   a. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include the following:

      1.) Diedrich Technologies, Inc. 800-323-3565 www.diedrictech.com
      2.) EaCo Chem, Inc. 800-313-8505 www.eacochem.com
      3.) PROSOCO Incorporated 800-255-4255 www.prosoco.com

2.18 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

B. Mixing: Combine and thoroughly mix cementitious, water and aggregate in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.

1. Do not re-temper colored mortars, if any.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.

1. Limit cementitious materials in mortar to portland cement and lime.
2. For masonry below grade, in contact with earth, and where indicated, use Type M.
3. For reinforced masonry and where indicated, use Type S.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.
   1. Mix to match Architect’s sample.

E. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.
   1. Mix to match Architect’s sample.
   2. Limit mineral-oxide pigments to no more than 10 percent of cement content by weight.

F. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of reinforced and nonreinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.
   1. Reinforced Masonry: Provide grout of compressive strength as indicated in Division 4 Section “Reinforced Unit Masonry”.
   2. Use fine grout in grout spaces less than 2 inches in horizontal direction, unless otherwise indicated.
   3. Use coarse grout in grout spaces 2 inches or more in least horizontal dimension, unless otherwise indicated.

G. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer’s directions.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.
   4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL
A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications. Provide not less than 8 inch of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting.

E. Install cut units with cut surfaces and, where possible, cut edges concealed.

F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.
G. Matching Existing Masonry: Match coursing, bonding, color, and texture of new Work with existing masonry.

H. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

I. Do not wet concrete masonry units.

J. Remove any detrimental substances from reinforcing steel prior to placement.

3.3 CONSTRUCTION TOLERANCES

A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.

2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

3. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.

4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).

5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

6. For lines and surfaces (surface planes) do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations. Lay-up walls to comply with indicated construction tolerances, with courses accurately spaced and coordinated with other work.

B. Pattern Bond: Lay exposed masonry in the bond pattern shown or, if not shown, lay in running bond with vertical joint in each course centered on units in courses above and below.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4 inch (100 mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated. Wedge partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead load deflection of structure above approaches final position.
1. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Fire Resistive Joint Systems."

J. Where indicated, leave a 1 inch space between top of masonry and floor or roof structure above. Brace masonry from structure with 16 gage galvanized steel angles having 4 inch equal legs and 8 inch lengths mechanically anchored to the floor or roof structure and spaced not more than 4 feet o.c.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry units as follows:
   1. With bed (horizontal) and head (vertical) joints between units completely filled with mortar.
   2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
   3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As Work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.

C. Maintain joint widths shown, except for minor variations required to maintain bond alignment. Unless otherwise indicated, lay walls with 3/8 inch joints.

D. Where weep holes are indicated or required, provide PVC Honeycomb weep vents in head joints in lieu of weep tubes or other devices, unless otherwise indicated.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.

F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

G. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

H. Collar Joints: Where solid masonry walls are indicated, after each course is laid, fill vertical longitudinal joint between wythes solidly, and with mortar for the following masonry Work:
   1. Exterior walls (where indicated), except cavity walls.
   2. Nonloadbearing interior walls or partitions where metal ties or horizontal reinforcing are indicated for structural bonding and nominal thickness of wall or partition is required to meet code requirements for height-to-thickness ratio.

3.6 BONDING OF MULTIWYTHE MASONRY

A. Use continuous masonry joint reinforcement installed in horizontal mortar joints to bond wythes together. Provide at not greater than 16 inches o.c. vertically.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

   1. Provide continuity with masonry joint reinforcement at corners by using prefabricated "L" units as well as masonry bonding.

C. Intersecting and Abuting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes, and bond walls together as follows:
1. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.

D. Intersecting Load-bearing Walls: If carried up separately, block or tooth vertical joint with 8 inch maximum offsets and provide rigid steel anchors spaced not more than 4 feet o.c. vertically, or omit blocking and provide rigid steel anchors at not more than 2 feet o.c. vertically. Form anchors of galvanized steel not less than 1-1/2 inch x 1/4 inch x 2 feet long with ends turned up not less than 2 inches or with cross-pins. If used with hollow masonry units, embed ends in mortar-filled cores.

### 3.7 CAVITIES

A. Keep cavities clean of mortar droppings and other materials during construction. Do not allow the formation of mortar bridges. Do not allow mortar or other materials to block drainage paths or weepholes. Do not allow mortar or other materials to accumulate on flashings, ties, or other cavity elements. Follow recommendations of BIA Technical Note 21C and other workmanship standards indicated or required. Strike joints facing cavities flush.

B. Installing Cavity-Wall Insulation: Where damproofing is not utilized as an adhesive surface for application of board cavity-wall insulation, install small pads of compatible adhesive spaced approximately 1 foot o.c. both ways on inside face of boards. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

C. Tie exterior wythe to back-up with continuous horizontal joint reinforcing, installed in mortar joints at not more than 16 inches o.c. vertically and in the joint below the top-most veneer masonry unit.

D. Provide weep holes in exterior wythe of cavity wall located immediately above ledges and flashing, spaced 16 inches o.c., unless otherwise indicated. Ensure that weeps are laid on top of ledge below and not on top of mortar bed.

### 3.8 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch (25 mm) in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.

2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally.

### 3.9 ANCHORING MASONRY VENEERS

A. Anchor single wythe masonry veneer to metal studs with masonry veneer anchors to comply with the following requirements:

1. Fasten each anchor section through sheathing to metal studs with metal fasteners of type and quantity indicated.

2. Embed tie section in masonry joints. Provide not less than 2 inch air space between back of masonry veneer wythe and face of sheathing.

3. Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.

4. Space anchors as indicated but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally. Install additional anchors within 1 foot of openings and at intervals around perimeter not exceeding 3 feet.

### 3.10 HORIZONTAL JOINT REINFORCEMENT
A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Reinforce walls with continuous horizontal joint reinforcing.

D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

E. Space continuous horizontal reinforcement as follows:
   1. For multi-wythe walls (solid or cavity) where continuous horizontal reinforcement acts as structural bond or tie between wythes, space reinforcement as required by code but not more than 16 inches o.c. vertically.
   2. For single-wythe walls, space reinforcement at 16 inches o.c. vertically, unless otherwise indicated.
   3. For parapets, space reinforcement at 8 inches o.c. vertically, unless otherwise indicated. Locate reinforcement with 8 inches o.c. spacing below the wall anchor support point for a distance equal to the height of the parapet wall above the support.

F. Reinforce masonry openings greater than 1 foot wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8 inches apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2 feet beyond jambs of the opening except at control joints.
   1. In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

3.11 CONTROL AND EXPANSION JOINTS

A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown; and if not shown, provide control and isolation joints as recommended by BIA and NCMA and as follows:
   1. Interior Partitions: Provide vertical expansion joints 25 feet o.c. horizontally (maximum).
   2. Exterior Cavity Walls: Provide vertical expansion joints 20 feet o.c. horizontally (maximum).
   3. Steel Lintels: Provide horizontal bond breaks at the end bearing to allow for thermal expansion and contraction.
   4. Openings in Exterior and Interior Walls: At masonry with steel lintels, provide expansion joints on each side of the opening continuing to the top and bottom of the brick wythe and as specified above. At concrete masonry unit lintels, provide control joints in alignment with the outside ends of the lintel continuing to the bed joint and then with horizontal bond breaks at the end bearing.
   5. At exterior windows only, at concrete masonry unit sills and lintels, provide control joints in alignment with the outside ends of the sill/lintel continuous vertically.

B. Build-in related items as the masonry Work progresses.

C. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.

D. Build flanges of factory-fabricated expansion joint units into masonry. See Division 7 Section "Joint Sealants".

E. Build-in non-metallic joint filler where indicated.

F. Build in horizontal pressure relieving joints where indicated; construct joints by either leaving an air space or inserting non-metallic compressible joint filler of width required to permit installation of sealant and backer rod.
   1. Locate horizontal pressure relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.
3.12 LINTELS

A. Install galvanized steel lintels where indicated.

B. Provide masonry lintels where shown and wherever openings of more than 1 foot for brick size units and 2 feet for block size units are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.

1. For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.13 FLASHING OF MASONRY WORK

A. General: Provide concealed flashing in masonry Work at, or above, shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior.

B. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and turn down to form drip 1/4 inch in length when finished.

C. At masonry walls intersecting with roofs, provide elastic sheet flashing as indicated on the drawings and herein specified with steps, lapped joints set in compatible adhesive, and end dams. Before proceeding with the masonry Work, notify the Architect. Only after the Architect has witnessed the flashing Work in place shall the Contractor continue the masonry Work.

D. Extend flashing the full length of lintels and shelf angles and minimum of 4 inches into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 8 inches, and through the inner wythe to within 1/2 inch of the interior face of the wall in exposed Work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 8 inches. At heads and sills turn up ends not less than 2 inches to form an end dam as recommended by BIA and illustrated in BIA Technical Note 7, Figure 21, current edition.

E. If installing Rubberized-Asphalt Flashing, do not install it adjacent to or in contact with flexible vinyl products (PVC). Maintain separation between these two dissimilar materials.

F. Install flashing to comply with manufacturer’s installation requirements.

G. Provide weep holes in the head joints of the first course of masonry immediately above concealed flashings. Space 16 inches o.c.

H. Install reglets and nailer for flashing and other related work where shown to be built into masonry Work.

3.14 INSTALLATION OF REINFORCED UNIT MASONRY

A. Refer to Division 4 Section “Reinforced Unit Masonry” for installation requirements applicable to reinforced unit masonry.

3.15 FIELD QUALITY CONTROL

A. Provide a water test at all through wall flashing locations around the building to ensure that all weeps are free of debris and flowing. Ensure that Architect and waterproofing consultant are present for test.

B. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below.

1. Payment for these services will be made from by the Owner.

2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
3. Comply with requirements for qualification and acceptance of testing laboratory specified in Part 1 for preconstruction testing service.

C. Unit Test Method:

1. Testing Sand: During progress of mixing and placing mortar on job, take one sand specimen per 25 cubic yards of mortar and test in accordance with ASTM C117 and ASTM C136.
2. Testing Job Site Mortar: During progress of placing mortar on job, take one mortar specimen per 25 cubic yards of mortar and test in accordance with ASTM C780.
3. Testing Grout: During progress of placing mortar on job, take one specimen per 25 cubic yards of grout and test in accordance with U.B.C.Standard 21-18, with minimum compressive strength of 2,500 psi.
4. Brick Tests: For each type and grade of brick indicated, test units by methods of sampling and testing of ASTM C 67 except select 5 bricks at random for each 100,000 units or fraction thereof installed.
5. Concrete Masonry Unit Tests: For each type, class and grade of concrete masonry unit indicated, test units by method of sampling and testing of ASTM C 140.
6. Prism Test Method (if used):
   a. Compression Test: For each type of wall construction indicated for testing, test masonry prisms by methods of sampling and testing of ASTM C1314 and as follows:
      1.) Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.
      2.) For brick masonry prisms provide same height-to-thickness ration (h/t) as specified under preconstruction testing.
      3.) For concrete masonry prisms provide same height-to-thickness ration (h/t) as specified under preconstruction testing.
      4.) Conduct tests no less frequently than that required to provide sets of prisms from each 5,000 sq. ft. of wall area installed.

D. Report test results in writing and in form specified under each test method, to Architect and Contractor, on same day tests are made.

E. Evaluation of Quality Control Tests: Masonry Work, in absence of other indications of noncompliance with requirements, will be considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.

F. The Contractor shall conduct Water Leak Testing of the wall drainage system per the “Quality Assurance” Article. The Contractor shall submit the required report, to the Owner, indicating a successful Water Leak Test was achieved.

3.16 PARGING

A. Pare predampened masonry walls, where indicated, with Type S or Type N mortar applied in 2 uniform coats to a total thickness of 3/4 inch (19 mm). Scarify first parge coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect the parging until cured.

3.17 REPAIRING, POINTING, CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.

C. In-Progress Cleaning: Clean unit masonry as Work progresses daily, by dry brushing and or dry cloth to remove mortar fins and smears before tooling joints. Do not allow excess mortar lumps or smears to harden on...
the finished surfaces of masonry. Remove green mortar with burlap or dry cloth. Harsh cleaning methods after walls have been erected may mar the surface of the Work. High pressure spraying is not allowed.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
3. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
4. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
5. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
6. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution, or clean masonry with a proprietary acidic cleaner applied according to the brick and the cleaning manufacturer's written instructions and approval.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

E. Protection: Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures unit masonry Work being without damage and deterioration at time of substantial completion.

3.18 INSTALLATION OF EMBEDDED (THROUGH-WALL) FLASHING IN EXISTING MASONRY VENEER OR CAVITY WALLS

A. General: To install continuous flashing in existing masonry walls, remove alternate sections of outer wythe (exterior and exposed to view) in 2 feet to 5 feet lengths, in accordance with BIA and NCMA recommendations. Support and protect remaining masonry that surrounds removal area - maintain any flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Flashing and drainage material shall be installed in these sections of walls, and the masonry placed back into it's original position to match the original pattern of the masonry, if any, unless otherwise indicated on the drawings. Alternately, temporary braces may be installed to allow for longer sections of masonry walls to be accessed. At joints, the flashing shall be lapped a minimum of 6 inches, and shall be completely sealed to function properly. Provide end dams at step ups in substrates, ledges and other steps. Replace masonry as described for new construction in other paragraphs of this specification and as described below.

B. Brick Removal:

1. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
2. Remove in an undamaged condition as many whole bricks as possible for reuse.
   a. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
   b. Store brick for reuse, as indicated or securely if not indicated.
   c. Deliver cleaned brick not required for reuse to Owner's Agent, unless otherwise directed.
3. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry backup, rotted wood, rusted metal and other deteriorated items.

C. Installation of Wall Drainage System:

1. Wall drainage device shall be placed vertically on top of the flashing inside the wall cavity where it shall catch and permanently suspend mortar droppings above the level of the weep holes and flashing.

D. Brick Replacement:

1. Clean bricks surrounding removal areas by removing mortar, dust, and loos particles in preparation for replacement.
2. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
3. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid. Maintain joint width for replacement units to match existing joints.

   a. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.

4. Replaced masonry shall be properly cured (5 to 7 days) before the intermediate masonry sections or supports are removed.

3.19 MASONRY WASTE DISPOSAL

   A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry Work, remove from Project site.

END OF SECTION 042000
SECTION 04 72 00 – CAST STONE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Cast stone lintels.

1.3 DEFINITIONS

A. Cast Stone: Architectural precast concrete building units intended to simulate natural cut stone.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for cast stone units.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions; details of reinforcement and anchorages, if any; and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples: For each color and texture of cast stone required, 10 inches (250 mm) square in size.

D. Samples for Verification: For each mortar color required, showing the full range expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label samples to indicate type and amount of colorant used.

E. Full-Size Samples: For each type of cast stone unit required. Make available for Architect's review at Project site before installing cast stone.

1. Approved Samples may be installed in the Work.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.

G. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of cast stone with requirements indicated.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing cast stone units similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to manufacture required units.

B. Source Limitations for Cast Stone: Obtain cast stone units through one source from a single manufacturer.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
D. Mockups: Prior to installing cast stone, construct mockups to verify selections made under Sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Mockups shall be built by the Subcontractor responsible for the Project Work. Build mockups to comply with the following requirements, using all conditions and materials indicated for the completed Work:

1. Locate mockups on-site in the location and size indicated or, if not indicated, as directed by Architect. Coordinate mockups with mockups for Division 4 Section “Unit Masonry Assemblies”.

2. Build mockups for the following types of cast stone in sizes approximately 96 inches (2400 mm) long by 96 inches (2400 mm) high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches (400 mm) long in each mockup.

   a. Typical exterior wall with through-wall flashing installed for a 24 inch (600 mm) length in corner of mockup approximately 16 inches (400 mm) down from top of mockup, with a 12 inch (300 mm) length of flashing left exposed to view (omit masonry above half of flashing).

   b. Typical exterior wall with window opening, framed with stone trim (where applicable).

   c. Typical exterior masonry-veneer wall complete with metal studs, sheathing, veneer ties, flashing, and weep holes.

   d. Typical interior cast stone walls of all types included in the Work.

3. Clean exposed faces of mockups.

4. Notify Architect 7 days in advance of dates and times when mockups will be constructed.

5. Demonstrate the proposed range of aesthetic effects and workmanship.

6. Obtain Architect’s approval of mockups before start of glass unit masonry assemblies Work.

7. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

8. Approval of mockups is for color, texture, and blending of cast stone units; relationship of mortar and sealant colors to cast stone unit colors; tooling of joints; and aesthetic qualities of workmanship. Mockups shall in all cases represent the level of workmanship to be provided, including the extent of excess mortar to be cleaned from completed masonry.

   a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.

   b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.

9. When directed, demolish and remove mockups from Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship cast stone units in suitable packs or pallets.

   1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.

   2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

B. Store installation materials on elevated platforms, under cover, and in a dry location.

C. Store mortar aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.7 COORDINATION

A. Coordinate production and delivery of cast stone with unit masonry work to minimize the need for on-site storage and to avoid delaying the Work.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include the following:
2.2 CAST STONE MATERIALS

A. General: Comply with ASTM C 1364 and the following:

2.3 CAST STONE UNITS

A. Provide cast stone units complying with ASTM C 1364.

B. Reinforce units as indicated and as required by ASTM C 1364. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches (38 mm) of material.

C. Fabricate units with sharp arris and details accurately reproduced with indicated texture on all exposed surfaces, unless otherwise indicated.

1. Slope exposed horizontal surfaces at least 1:12, unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements, unless otherwise indicated.

D. Cure and finish units as follows:

1. Cure units in totally enclosed curing room under dense fog and water spray at 95 percent relative humidity for 24 hours.
2. Yard cure units until the sum of the mean daily temperatures for each day equals or exceeds 350 deg F.
3. Acid etch units to remove cement film from surfaces indicated to be finished.

E. Color, texture and other finish characteristics: Refer to the project’s “Color Schedule”. If there are no color, texture or other finish characteristics indicated, provide the product with characteristics selected by the Architect from the manufacturer's full range of available standard and premium: colors, patterns, textures and options. Provide products with variations from the standard and premium characteristics, where indicated.

2.4 MORTAR MATERIALS

A. [Provide mortar materials that comply with Division 4 Section "Unit Masonry Assemblies"].

B. Water: Potable.

2.5 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from stainless steel complying with ASTM A 276 or ASTM A 666, Type 304.

B. Dowels: Round stainless-steel bars complying with ASTM A 276, Type 304, 1/2-inch (12-mm) diameter.

C. Job-Mixed Detergent Solution: Solution of 1/2 cup (125 mL) of dry-measure tetrasodium polyphosphate and 1/2 cup (125 mL) of dry-measure laundry detergent dissolved in 1 gal. (4 L) of water.

2.6 MORTAR MIXES

A. Setting Mortar: Comply with ASTM C 270, Proportion Specification, Type S.

1. Limit cementitious materials to portland cement and lime.

PART 3 - EXECUTION
3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of cast stone.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Set cast stone as indicated on Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

B. Drench units with clear water just before setting.

C. Set units in full bed of mortar with full head joints, unless otherwise indicated. Build anchors and ties into mortar joints as units are set.
   1. Fill dowel holes and anchor slots with mortar.
   2. Fill collar joint solid as units are set.
   3. Build concealed flashing into mortar joints as units are set.
   4. Leave head joints open in coping and other units with exposed horizontal surfaces. Keep joints clear of mortar, and rake out to receive sealant.

D. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

E. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

G. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
   1. Sealing joints is specified in Division 7 Section "Joint Sealants."
   2. Keep joints free of mortar and other rigid materials.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.

B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not exceed 1/16 inch (1.5 mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.4 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Clean cast stone by bucket and brush hand-cleaning method described in BIA Technical Notes No. 20 Revised II, using job-mixed detergent solution.
SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

A. The Drawings and General Provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to work specified in this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Furnish all labor, materials, services, equipment and appliances required in conjunction with or properly incidental to furnishing, fabrication, delivery, and erection of structural steel complete, including, but not limited to, the following:

1. Structural steel columns, girders, beams, angles, rigid frames, trusses, shelf angles, angle frames for openings in floors and roofs, galvanized cooling tower grillage, steel supports for elevator machines, steel hoist beams for elevator equipment, steel supports for elevator guide rails, steel crane rails and stops, steel plates, miscellaneous deck support angles, shop welded shear studs, connections and component parts.

2. Qualification of welders.
3. Shop prime coat of paint and field touch-up painting.
4. Temporary construction bracing.
5. Fabrication/erection inspection and testing.

B. Extent of structural steel work is shown on Drawings including schedules, notes and details to show sizes and locations of members, typical connections and types of steel required.

C. Include all supplementary parts and members necessary to complete structural steel work, regardless of whether all such parts are definitely shown or specified and furnish all such bolts, gussets, plates, etc., as may be required for proper assembly of all items. Include miscellaneous deck support angles as required for proper support of metal floor deck around columns, gussets, openings, and obstructions.

D. Connection Design:
1. All typical beam to column and beam to beam connections are detailed and shown on the Construction Documents. The Contractor is to comply with these details.
2. Where indicated, truss, bracing connections and special or non-typical structural steel beam connections shall be designed by the fabricator, in accordance with criteria on Drawings. Fabricator-designed connections shall be submitted together with complete calculations for review for acceptability by the Architect.

E. Substitutions:
1. Proposed substitutions of sections or modification of details, and reasons therefor, shall be submitted with shop drawings for review. Submitted substitutions must be clearly identified and noted as such. Approved substitutions, modifications, and necessary changes in related portions of work shall be coordinated by fabricator and shall be accomplished at no additional cost to Owner.
2. Substitutions to the beam to column and beam to beam connections shown on the drawings will be reviewed for acceptability if submitted with calculations prepared by a licensed professional engineer.

F. Responsibility for Errors: Fabricator shall be responsible for all errors of detailing, fabrications, and for correct fitting of structural steel members.

G. Templates: Shall be furnished by fabricator with instructions for setting of anchor bolts and bearing plates.

H. Related Work Specified in Other Sections:
1. Testing laboratory services for verification of quality: Section 01 4529.
2. Embedded metal assemblies: Section 03 2000.
3. Open web steel joists and joist girders: Section 05 2100.
4. Metal roof decking: Section 05 3123.
5. Cold-formed metal framing: Section 05 4000.
6. Metal fabrications: Section 05 5000.
7. Metal stairs: Section 05 5100.
8. Painting: Section 09 9000.
9. Sustainable Design Requirements: Section 01 8113.

1.3 QUALITY CONTROL

A. Latest adopted edition of all standards referenced in this Section shall apply, unless noted otherwise. In case of conflict between Contract Documents and a referenced standard, Contract Documents shall govern. In case of conflict between Contract Documents and Building Code, more stringent shall govern.

B. Contractor shall furnish fabrication/erection inspection and testing of all welds in accordance with AWS D1.1, Chapter 6. Submit records of inspections and tests to Owner's testing laboratory for their review.

C. Fabricator shall have developed a detailed fabrication procedural manual reflecting key quality control procedures used in fabrication process and shall provide a copy of the manual for examination by Owner's testing laboratory.

D. Fabricator shall employ a competent technician, engineer or independent testing laboratory to inspect fabrication work to ensure compliance with Contract Documents and shall identify such inspector to Owner's testing laboratory. Inspector shall examine in the shop all welding, bolting, shear studs, painting, galvanizing, and straightness and alignment of fabricated members.

E. Testing Laboratory Services for Verification of Quality: Refer to Section 01 4529.

F. All materials, fabrication procedures, and field erection are subject to verification inspection and testing by Owner's testing laboratory, in both shop and field. Such inspections and tests will not relieve Contractor of his responsibility for providing materials and fabrication procedures in compliance with specified requirements. Owner reserves the right to use ultrasonic or radiographic inspection to verify adequacy of all welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1. Promptly remove and replace materials or fabricated components which do not comply.

G. Qualifications for Welding Work: Contractor shall be responsible for qualifying welding operators in accordance with AWS "Standard Qualification Procedure." Provide certification, to Owner's testing laboratory, that welders to be employed in work have satisfactorily passed AWS qualification tests and are currently qualified. Welders who have changed employers or who have not performed the designated weld for a period of 6 months or longer since the last qualification shall be retested. If requalification of welders is required, retesting will be Contractor's responsibility.

H. Qualifications of Welding Procedures: Contractor shall provide testing laboratory with welding procedures which are to be used in executing this work. Welding procedures shall be qualified prior to use in accordance with AWS D1.1, Part B.

I. Comply with Provisions of the Following Codes, Specifications and Standards, in Addition to Building Code:
   1. AISC, "Code of Standard Practice for Steel Buildings and Bridges."
   2. AISC, "Specification for Structural Steel Buildings," including "Commentary" and Supplements thereto, as issued.
4. AISC, "Specification for Architecturally Exposed Structural Steel."
5. AWS D1.1, "Structural Welding Code."
8. Steel structure painting council:

J. Qualifications:
1. Structural steel fabricator shall comply with one of the following:
   a. Structural steel fabricator shall have not less than 10 years experience in fabrication of structural steel for buildings and shall be currently certified under the AISC Certification Standard for Steel Building Structures. Submit proof of certification with bid.
   b. An otherwise qualified fabricator who is not a member of the AISC Quality Certification Program may be acceptable if satisfactory evidence of qualifications is submitted prior to contract award. For non-certified fabricators, Contractor shall submit, for consideration, a resume describing plant size, equipment, quality control procedures and personnel, and experience on comparable work in the last 3 years. Final acceptability shall be subject to approval of the Architect.
2. Structural steel erector shall have not less than 5 years experience in erection of comparable structures and shall be currently certified under the AISC Certified Steel Erector (CSE) category.

1.4 SUBMITTALS

A. Mill Certificates: Submit for Architect's record certificates of mill analysis showing compliance with Specifications for the following products:
   1. Structural steel (each type).
   2. High-strength bolts (each type), including nuts and washers.
   3. Shear studs.

B. Shop Drawings:
   1. All typical beam to column and beam to beam connections are detailed and shown on the Contract Documents. The Contractor is to comply with these connection details. If the Contractor would like to substitute a connection, it shall be submitted in accordance with the specified procedure for substitutions, with calculations prepared by a licensed professional engineer.
   2. Submit shop drawings of all structural steel, including complete details and schedules for fabrication and shop assembly of members, erection plans and details, procedures, and diagrams showing sequence of erection. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
   3. Submit design calculations for the non typical beam, truss and bracing connections that are designed by the fabricator. Calculations shall bear seal of a Licensed Professional Engineer, licensed in the State of Texas. Calculations shall show applied loads and reference applicable piece mark from the shop drawings as well as location or mark from structural drawings.
   4. Structural steel members for which shop drawings have not been reviewed shall not be fabricated. Architect's review shall cover general locations, spacings, and details of design. Omission from shop drawings of any materials required by Contract Documents shall not relieve Contractor of responsibility of furnishing and installing such materials, even though such shop drawings may have been reviewed and returned.
   5. Submit setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by other trades.
C. Certification: Submit evidence of current AISC plant certification (see "Qualifications").

D. Documentation for LEED Credit MR 4.1 and Credit MR 4.2: For products having recycled content. Indicate percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

E. Documentation for LEED Credit MR 5.1 and Credit MR 5.2: For products that are extracted, harvested or recovered and manufactured from within 500 miles of Project. Indicate location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw or recycled material. Include statement indicating costs for each product that is regionally extracted, harvested or recovered and manufactured.

F. Documentation for LEED Credit EQ 4.1 and 4.2: Paints, coatings, adhesives, sealants, stains, caulk, firestopping, etc. inside the weatherproofing systems and applied on site only in this specification must comply with the VOC limits in Section 01 8113. Include product data sheet or MSDS clearly showing VOC content of product in grams/Liter.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay that work.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

D. Support cambered members during shipment and handling in a manner which will not result in loss of camber.

1.6 JOB CONDITIONS

A. Coordinate erection of structural steel with work of other trades.

B. Do not install columns which have embeds or anchor bolts in concrete until concrete members have attained their 28 day compressive strengths.

PART 2 PRODUCTS

2.1 GENERAL

A. All products shall be extracted, harvested or recovered and manufactured from within 500 miles of Project. All reinforcing bar and steel components shall contain minimum 75% recycled content, all raw materials shall be manufactured and extracted within 500 miles of Project site and all recycled materials shall be manufactured and recovered within 500 miles of the Project site.

B. All paints, coatings, adhesives, sealants, stains, caulk, firestopping, etc. applied on site only in this specification must comply with the VOC limits in Section 01 8113. In submittal, include product data sheet or MSDS clearly showing VOC content of product in grams/Liter.

2.2 MATERIALS

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
B. Steel:
   2. Other rolled shapes, plates, and bars: ASTM A 36 (36 ksi yield).
   3. Hollow structural sections (HSS or TS): ASTM A 500, Grade B, (46,000 psi yield for square shapes and 42,000 psi for round shapes).
   4. For ASTM A 6 Group 3 rolled shapes having flanges thicker than 1 1/2" and Groups 4 and 5 rolled shapes (spliced or otherwise) connected by full penetration welds, provide material with Charpy V-Notch testing in accordance with ASTM A 6, Supplementary Requirement S5. Impact test shall meet a minimum average value of 20 foot-pounds absorbed energy at 70° F. and shall be conducted in accordance with ASTM A 673 and AISC Specifications for Structural Steel Buildings.

C. Bolts and Washers:
   1. Anchor bolts: Anchor bolts (or anchor rods) for anchoring to concrete shall conform to ASTM F1554, 36 KSI yield strength, and to requirements for regular hexagon bolts and nuts of ANSI Standards B18.2.1 and B18.2.2. Washers for anchor bolts shall be oversize or plate washers as specified, with a hole 1/16 inch larger than the bolt diameter.
   2. All bolts for connections shall be high strength bolts conforming to ASTM A 325. Dimensions of bolt heads and nuts shall conform to requirements for heavy hexagon nuts of ANSI Standards B18.2.1 and B18.2.2. Nuts shall be ASTM A 563 material.
   3. Washers: Flat and smooth circular hardened washers conforming to requirements of ASTM F 436. Beveled washers for "S" shapes and channels shall be square or rectangular, taper in thickness, and smooth. Washers for use with high-strength bolts shall be hardened.
   4. Direct tension indicator washers for high-strength bolts in friction connections shall conform to ASTM F 959, Type A 325.
   5. Tension control (twist off) bolts may, at Contractor's option, be used in lieu of conventional high-strength bolts. Tension control bolts shall conform to ASTM F 1852 with A 325 marking.
   6. Drilled Expansion Bolts in Masonry Shall Be One of the Following:
      a. Wedge-All, Simpson Strong-Tie Co., Pleasanton, CA
      b. Kwik Bolt 3, Hilti Fastening Systems, Tulsa, OK
   7. Drilled Adhesive Anchors in Masonry Shall Be One of the Following Anchoring Systems:
      a. SET Epoxy Tie, Simpson Strong-Tie Co., Pleasanton, CA
      c. HIT-HY 70 Adhesive Anchoring System, Hilti Fastening Systems, Tulsa, OK

D. Welding electrodes shall conform to requirements of Specifications of American Welding Society. Use E70 electrodes. For high-strength, low-alloy steel, provide electrodes, welding rods, and filler metals equal in strength and compatible in appearance with parent metal joined.

E. Primer Paint:
   1. Standard shop coat of primer, meeting requirements of "SSPC-Paint 15", Type I, applied to a dry film thickness of 2.0 mils.
   2. Primer Paint: Epoxy primer for exposed steel - Tnemec "Hi-Build Epoxoline II Series L69" Primer or Carboline "Carbogard 890 VOC" applied to a dry film thickness of 4 to 6 mils. Selected product shall qualify as a low VOC material under LEED requirements.
   3. For architecturally exposed steel - primer as specified in Division 9 or, if not specified, as recommended by manufacturer of finish coat specified in Division 9.

F. Zinc-coating: For galvanized steel shall conform to ASTM A 123, threaded products shall conform to ASTM A 153, Class C and sheet steel shall conform to ASTM A 591.

2.3 FABRICATION

A. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in the shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.

2. Provide camber in members where indicated. Specified camber applies at jobsite, just prior to erection, lying down flat so that member weight has no effect. Contractor shall take necessary precautions to prevent or compensate for camber loss during shipment. Measured camber in members up to 50'-0" long shall be within a tolerance of -0" to +1/2" from amount specified. For members greater than 50'-0" long, both positive and negative tolerance may increase 1/8" for every 10'-0" of length in excess of 50'-0". Members with a field measured camber outside of specified tolerance shall be returned to shop.

3. If heat is used to camber steel beams, it shall be carefully controlled and applied in a manner which will not alter the material properties of the member, and only in the presence of the testing laboratory. Follow AISC recommendations for heat cambering.

4. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

5. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

6. Splicing of structural steel members is prohibited without prior approval of Architect. Any member having a splice not shown and detailed on approved shop drawings shall be rejected.

7. Members in compression joints which depend on contact bearing shall have bearing surfaces milled to a common plane. Members to be milled shall be completely assembled before milling.

8. Plates shall be free of gross internal discontinuities such as ruptures and delaminations. Plates shall comply with ASTM A 578, Level 1.


B. Connections:

1. Weld or bolt shop connections, as indicated on Drawings.

2. Bolt field connections, except where welded connections or other connections are indicated. Provide specified threaded fasteners for all principle bolted connections. Holes for bolted connections shall be drilled or punched at right angles to member. Slope of surfaces under bolt head and nut shall not exceed 1:20. Provide beveled washers where slopes exceed 1:20. Bolt holes shall have a diameter not greater than 1/16" larger than nominal bolt diameter. Do not flame cut holes or enlarge by burning. Provide washers over all slotted holes in an outer ply.


4. Welded construction: Comply with AWS Structural Welding Code for procedures, appearance and quality of welds and methods used in correcting welding work. Assemble and weld built-up sections by methods which produce true alignment of axes without warp. Welds not specified shall be continuous fillet welds designed to develop full strength of member. No combination of bolts and welds shall be used for stress transmission at the same face of any connections.

5. Heavy shapes (ASTM A 6, groups 4 and 5, and built-up sections containing plates thicker than 2") : Comply with all special requirements for welding heavy shapes contained in the AISC Specification and in AWS Structural Welding Code.
6. Clean completed welds prior to inspection. Slag shall be removed from completed welds, and adjacent base metal shall be cleaned by brushing or other suitable means. Tightly adherent splatter remaining after cleaning is acceptable unless its removal is required for the purpose of nondestructive testing.

7. For high-strength, low-alloy steels follow welding procedures recommended by steel producer for exposed and concealed connections.

8. Base plates where exposed to view: Hole sizes for anchor bolts shall be as follows:
   - Bolts 3/4" to 7/8" diameter - 5/16" oversize
   - Bolts 1" to 2" diameter - 1/2" oversize
   - Bolts over 2" diameter - 1" oversize

   Use circular oversize washers under nut at all oversized holes in base plates. Washers must be large enough to cover entire hole. Washer thickness shall be at least 1/6 of bolt diameter.

9. Base plates where not exposed to view: Hole sizes for anchor bolts may be oversized to facilitate erection as follows:

<table>
<thead>
<tr>
<th>Anchor Bolt Diameter</th>
<th>Base Plate Hole Diameter</th>
<th>Min. Washer Diameter</th>
<th>Min. Washer Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4</td>
<td>1 5/16</td>
<td>2</td>
<td>1/4</td>
</tr>
<tr>
<td>7/8</td>
<td>1 9/16</td>
<td>2 1/2</td>
<td>5/16</td>
</tr>
</tbody>
</table>

All sizes are in inches. Plates used as washers may be square ASTM A 36 plate with sides equal to given diameter. (Ref. Table 14-2, AISC LRFD 3rd Ed.)

C. Steel Wall Framing: Select members which are true and straight for fabrication. Straighten as required to provide uniform, square, and true members in completed wall framing.

D. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

E. Zinc-coating: Following Steel Shall be Galvanized:
   1. Cooling tower grillage and supports, including fasteners.
   2. Cooling tower screen support members and braces.
   3. Masonry shelf angles.
   4. Exposed railing.

F. Architecturally Exposed Structural Steel: Shall be straight and true. Select or straighten members to meet permissible variations of ASTM A 6, subject to tolerances of AISC Code of Standard Practice, Section 10. Exposed surfaces shall be smooth, free of embedded scale, trademarks, roll imperfection marks and other irregularities. Fill any depressions with weld metal of the same composition as the parent metal. Grind welds and raised marks smooth and flush with adjacent surfaces.

G. At Structural Steel and Miscellaneous Steel members (channels, angles, beams, columns, etc.) separating interior spaces from the exterior environment and at other similar interior-to-exterior locations, fasten/weld members at connections as indicated in Contract Documents and approved Shop Drawings. At all locations where fastened/welded connections result in gaps between steel members, fill all gaps with automobile body filler-putty ("Bondo" by 3M or equivalent) and sand to finish smooth, prior to finish painting. Finished joints are to give the appearance of continuous welds and are to serve as weatherproof barriers to moisture penetration at these locations. NOTE: "Bondo" is not intended to replace the structural requirements of the Contract Documents or requirements of American Institute of Steel Construction (AISC.)
2.4 SHOP PAINTING

A. General: Shop paint structural steel, except members or portions of members to receive a galvanized coating or members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.
   1. Do not paint surfaces which are to be welded.
   2. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing.
   3. Do not paint surfaces of exposed high-strength, low-alloy steel members (weathering steel).
   4. Do not paint top surface of beams which support composite metal floor deck.
   5. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. Surface Preparation: After inspection and before shipping, clean steel to be painted. Remove loose rust, mill scale, spatter, and slag or flux deposits. Clean in accordance with Steel Structures Painting Council (SSPC) as follows:
   1. SP-2 "Hand Tool Cleaning" or SP-3 "Power Tool Cleaning" on members in enclosed air conditioned spaces.
   2. SP-6 "Commercial Blast Cleaning" for the following steel:
      All members exposed to weather
      Architecturally exposed members
      All members in nonconditioned spaces
      All members in crawlspaces
      All members in swimming pool area
   3. SP-10 "Near-White Blast Cleaning" for high-strength, low-alloy steel surfaces to avoid uneven oxidation.

C. Painting: Immediately after surface preparation apply structural steel primer paint in accordance with manufacturer's instructions, at a rate to provide a uniform dry film thickness as specified. Use painting methods which result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 EXECUTION

3.1 INSPECTION

A. Erector must examine areas and conditions under which structural steel work is to be installed, and notify Contractor of conditions detrimental to proper and timely completion of work.

3.2 SURVEY

A. Employ a licensed professional engineer or public surveyor, experienced in survey work, to establish permanent bench marks as shown and as necessary for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces and locations of anchor bolts and similar devices before erection work proceeds, report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

3.3 ERECTION

A. General: Comply with AISC Specifications and Code of Standard Practice, and as herein specified.

B. Temporary Shoring and Bracing:
   1. Provide adequate shoring and bracing to safely withstand all loads to which structure may be subjected during construction process including wind loads, dead loads, construction material, and equipment loads. Such bracing shall remain in place as long as required for safety.
2. As erection progresses, make a sufficient number of permanent welded or bolted connections to withstand erection stresses and maintain stability.

3. Design of temporary shoring and bracing shall be responsibility of Contractor. Contractor shall hire a Licensed Professional Engineer, licensed in the State of Texas, to design and detail temporary shoring and bracing.

C. Temporary Planking: Provide planking and working platforms, as necessary, to effectively complete work.

D. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work. Furnish templates and other devices as necessary for presetting bolts and other anchors in accurate locations. Refer to Division 3 of these Specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation.

E. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
   1. Set loose and attached base plates and bearing plates, for structural members, on leveling nuts, steel wedges or steel shims.
   2. Tighten anchor bolts after supported members are positioned and plumbed. Do not remove wedges or shims but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

F. Field Assembly:
   1. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   2. Level and plumb individual members of structure within tolerances defined by AISC Code for Standard Practice, unless closer tolerances are required for proper fitting of adjoining or enclosing materials, in which case the most stringent shall apply.
   3. Set horizontal members with their natural camber (or specified camber) up.
   4. Exposed-to-view faces of members designated as architecturally exposed structural steel shall be plumbed, leveled and aligned to a tolerance not to exceed 1/2 the amount permitted for structural steel, unless adjoining materials dictate a tighter tolerance.
   5. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
   6. Splice members only where indicated and accepted on final shop drawing.
   7. Where parts cannot be assembled or fitted properly, as a result of errors in fabrication or of deformation due to handling or transportation, such condition shall be immediately reported to Architect, along with proposed method of correction. Straightening of bends or warps shall be done by approved methods. Bent or damaged heat-treated parts will be rejected.
   8. Fastening of splices in compression members shall be done after abutting surfaces have been brought completely into contact.

G. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces. On non-exposed welded construction, erection bolts shall be tightened securely and left in place, or if removed, holes shall be filled with plug welds.

H. Bolted Connections:
   1. High-strength bolts shall be installed in conformance with "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts."
2. A 307 bolts and high-strength (A 325 and A 490) bolts noted to be “snug-tight” shall be tightened using a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench, bringing plies into snug contact. Tension control bolts, if used, may be tightened to their full design tension.

3. Bolted parts shall fit solidly together when assembled. All joint surfaces shall be free of burrs, dirt and other foreign material that would prevent solid seating of parts.

4. Bolts tightened by calibrated wrench or torque control shall have a hardened washer under the element (nut or bolt head) turned in tightening.

5. Hardened washers shall be placed over slotted holes in an outer ply. Hardened beveled washers shall be used where outer face of bolted parts has a slope greater than 1:20 with respect to bolt axis.

I. Field Welding: Comply with AWS Structural Welding Code and AISC Specification for Structural Steel Buildings. Pay particular attention to surface preparation, preheating, sequence, and continuity of welds. Where heavy shapes are to be welded, comply with all special requirements of AISC Specification and AWS Structural Welding Code.

J. Field Grinding of Exposed Welds: All visible field welds shall be ground smooth unless otherwise indicated.

K. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

L. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

M. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

N. Touch-up Painting: Immediately after erection clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas with same materials as used for shop painting. Apply by brush or spray, to provide a minimum dry film thickness of 2.5 mils for each coat.

O. Touch-up Cold Galvanizing: Immediately after erection, touch-up areas of hot-dip galvanized members where galvanizing has been abraded during shipping and erection and where it has been removed or damaged due to welding. Apply specified cold galvanizing compound by brush or spray in accordance with manufacturer’s instructions, to a minimum dry film thickness of 2.5 to 3.5 mils.

3.4 CLEANUP

A. Clean up all debris caused by work of this Section, keeping the area clean and neat at all times.

END OF SECTION
SECTION 05 21 00 - STEEL JOIST FRAMING

PART 1- GENERAL

1.1 REFERENCED DOCUMENTS
A. The Drawings and General Provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to work specified in this Section.

1.2 DESCRIPTION OF WORK
A. Work Included: Furnish all engineering, labor, materials, and equipment in conjunction with furnishing, manufacture, and erection of all open web joists and joist girders, including:
   1. Bridging.
   2. Ceiling extensions.
   3. Extended ends.
   4. Connections.
   5. Fabrication inspection and testing.
B. Related Work Specified Elsewhere:
   1. Metal roof decking: Section 05 31 23.
   2. Structural steel: Section 05 12 00.
   3. Miscellaneous metals: Section 05 50 00.
   4. Testing laboratory inspection for verification of quality: Section 01 45 29.
   5. Sustainable construction for LEED requirements: Section 01 81 13.

1.3 QUALIFICATIONS
A. Manufacturer shall be a member of the Steel Joist Institute and shall have been engaged in the design and manufacture of similar units for a period of not less than 5 years.
B. All welding, both shop and field, shall be done by AWS qualified welders. Qualification tests shall include welds of the type used in joist construction.

1.4 CODES AND STANDARDS
A. Latest adopted edition of all standards referenced in this Section shall apply, unless noted otherwise. In case of conflict between Contract Documents and a referenced standard, Contract Documents shall govern.
B. Open web steel joists shall be designed and fabricated in accordance with Standard Specifications for Open Web Steel Joists, K series, adopted by the Steel Joist Institute.
C. Long span steel joists shall be designed and fabricated in accordance with Standard Specifications for Long Span Steel Joists, LH series, and deep long span steel joists, DLH series, adopted by the Steel Joist Institute.
D. Joist girders shall be designed and fabricated in accordance with Standard Specifications for Joist Girders, adopted by the Steel Joist Institute.
E. Shop welds shall comply with Standard Specifications of the Steel Joist Institute, for applicable joist series.

1.5 QUALITY CONTROL
A. Manufacturer shall visually inspect connection welds and have a program for regular sampling and testing of connection welds.
B. Manufacturer shall have a program for establishing shop weld procedures and qualifying welding operators through AWS qualification tests.
C. Contractor shall be responsible for qualifying welding operators for field welding work, in accordance with AWS Standard Qualification Procedure. Provide certification, to Owner's testing laboratory, that welders to be employed in work have satisfactorily passed AWS qualification tests.
within the previous 12 months. If recertification of welders is required, retesting will be Contractor's responsibility.

D. All fabrications and erection of joists and joist girders, and connections to supporting members shall be subject to inspection and testing by an independent testing laboratory, both in the plant and at jobsite. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. Promptly remove and replace materials or fabricated components which do not comply.

E. Refer to Section 01 45 29, for testing laboratory services.

1.6 SUBMITTALS

A. Shop Drawings: Submit detailed fabrication and erection drawings for all joists and joist girders. Shop drawings shall include dimensioned setting plans, piece fabrication drawings (shop tickets), connection details, bridging, camber, coatings, chord sizes, material properties, and uplift capacity.

B. Submit, for Architect's records, copies of certified mill tests indicating material compliance with ASTM and SJI Specifications.

C. Submit, for Architect's records, a record of design verification tests evidencing compliance with SJI Specifications regarding joint capacity and member strength.

D. Submit 2 copies of design calculations for all joist girders, and for joists for which the standard load tables are not applicable, prior to or with shop drawings. Calculations shall bear the seal of a Licensed Professional Engineer, licensed in the State of Texas. Shop drawings submitted without corresponding calculations will be returned unchecked as an incomplete submittal. Calculations will be reviewed for loading conditions and deflection criteria. Any exceptions will be noted and the applicable pages will be returned to the manufacturer for correction or clarification.

E. Submit, at completion of fabrication, a certificate of compliance in accordance with International Building Code Section 1704.2.2 stating that work was performed in accordance with approved construction documents and with SJI standard specifications.

F. LEED Documentation Submittals: These submittals are to be submitted one time with related submittals and/or if any changes exist during construction.
   1. Credit MR4.1 and 4.2: Provide a final summary at the end of construction documenting total recycled content in building materials.
      a. Product Data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
      b. Letter Template as appropriate to submittal content with actual values input.
   2. Credit MR5 and 5.2: Provide a final summary at the end of construction documenting total regional materials used:
      a. Product Data indicating location of material manufacturer for regionally manufactured materials.
         1) Include statement indicating cost, and distance from manufacturer to Project for each regionally manufactured material.
         2) Include statement indicating cost, and distance from point of extraction, harvest, or recovery to Project for each raw material used.
      b. Letter Template as appropriate to submittal content with actual values input.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All products shall be extracted, harvested or recovered and manufactured from within 500 miles of Project. All reinforcing bar and steel components shall contain minimum 95% recycled content, all raw materials shall be manufactured and extracted within 500 miles of Project site and all recycled materials shall be manufactured and recovered within 500 miles of the Project site.

B. Materials Shall Conform to the Following Requirements:
   1. Steel accessories: Bearing plates, bridging, wall anchors, etc., shall conform to the current
3. Welding electrodes: Shall conform to requirements of the specified SJI Standards.
4. Steel joists: Materials shall conform to requirements of the specified SJI Standards.
5. Shop paint: Conform to requirements of SSPC-Paint 15, Type I.

PART 3 - EXECUTION

3.1 DESIGN

A. Design all joists in accordance with referenced Steel Joist Institute Standards.

B. Where applicable loading or span configuration is other than uniformly loaded simple span condition, as covered by Standard Load Tables adopted by Steel Joist Institute, joist manufacturer shall design joist for the specific condition shown on Drawings, and all temporary construction loading. Deflection of cantilever joists shall be limited to 1/240 of cantilever length.

3.2 FABRICATION

A. Contractor alone shall be responsible for errors in fabrication and for correct fitting of joists.

B. Joints: Join members by welding in a manner that produces finished connection of ultimate strength, equal to twice the design strength required by standard load tables. Shop splices may occur in chord or web members. Members containing a butt weld splice shall develop an ultimate tensile force of at least 57,000 psi times the full design area of the chord or web, as verified by tests.

C. Holes shall not be made or enlarged by burning, nor will burning of unfair holes in shop or field be permitted.

D. Accessories: Provide all necessary sag rods, bridging, extended bottom chords and top chords, side wall anchors, wall connectors, headers, and ceiling extensions.

E. Shop Paint: After fabrication, clean joists, bridging, anchors, etc., of rust, mill scale, dirt or other foreign material by approved methods. Remove grease or oil with benzene or similar volatile cleaner. After cleaning joists, bridging, etc., apply a coat (not less than 2.0 mils thick) of the specified paint, either by dipping or airless pressure spray. For joists exposed in crawlspace, after cleaning apply specified 2-coat paint system according to paint manufacturer’s instructions or galvanize as specified.

F. Extended Ends:
   1. Provide extended ends for top chords of joists where indicated. Extension members shall be designed as cantilever beams with their reactions carried back at least to the first panel point of the joist.

G. Joists shall be provided with positive camber of magnitude recommended by Steel Joist Institute for the various spans, unless another profile is shown.

H. Welds Shall Meet the Following Criteria for Acceptance:
   1. Prior to inspection, weld slag shall be removed.
   2. Cracks are not acceptable and shall be repaired.
   3. Thorough fusion shall exist between weld and base metal, determined by visual inspection.
   4. Unfilled weld craters shall not be included in design length of the weld.
   5. Undercut shall not exceed 1/16” provided it is oriented parallel to principal stress.
   6. Sum of surface (piping) porosity diameters shall not exceed 1/16” in any 1” of design weld length.
   7. Weld spatter that does not interfere with paint coverage is acceptable.

3.3 ERECTION

A. All erection procedures shall comply with AISC, SJI, OSHA and manufacturer’s recommendations. Provide adequate temporary bracing and erection connections to assure safety and stability during erection and until permanent connections are completed.

B. Bridging shall conform to referenced SJI standards and information contained on Drawings.
Provide and install extra bridging, where indicated, in addition to minimum Steel Joist Institute requirements. Locate bridging lines where shown, or if not shown, equally space within Steel Joist Institute's limitations.

C. Minimum bearings and anchorage shall conform to referenced SJI standards and the Drawings as related to particular type of support.

D. Set joists to lines, levels and spacing indicated. Provide bearing plates indicated and/or required to carry out structural requirements. Execute general handling and erection in accordance with referenced SJI standards.

E. Joists shall be permanently fastened to supports and all bridging and anchorage completely installed before any construction loads are placed on joists.

F. Execute field welding in accordance with AWS D1.1, "Structural Welding Code-Steel," as amended to date. Use only welding operators who have been previously qualified to perform type of work required.

G. After erection, field connections and all abraded places of shop paint shall be touched up with same kind of paint as shop coat.

END OF SECTION 05 21 00
SECTION 05 3123 - STEEL ROOF DECKING

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

A. The Drawings and General Provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to work specified in this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Furnish all materials, supplies, equipment, tools, transportation and facilities, and perform all labor and services required in connection with or incidental to steel roof decking, as described in this Section of Specifications, shown on Drawings, or reasonably implied therefrom. Include all reinforcing plates, sump pans, edge closures, pour stops, and related accessories.

B. Related Work Specified Elsewhere:
   1. Open web steel joists: Section 05 2100.
   2. Structural steel: Section 05 1200.
   3. Miscellaneous metals: Section 05 5000.
   4. Laboratory inspection: Section 01 4529.
   5. Sustainable Design Requirements: Section 01 8113.

1.3 QUALIFICATIONS

A. Steel deck installer shall have a minimum of 5 years successful experience, 2 successful projects of a comparable size and scope to this project and be approved by the steel deck supplier.

1.4 QUALITY ASSURANCE

A. Refer to Section 01 4529 for testing laboratory services.

B. Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.

C. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated or specified:

D. Qualification of Field Welding: Qualify welding processes and operators in accordance with AWS D1.3 procedures. Each welder must pass the welder qualification test for metal deck.


1.5 SUBMITTALS

A. Product Certification: Submit specifications and installation instructions for each type of deck specified. Also, submit a certificate of product compliance with SDI, UL, and ICC standards, as specified. Manufacturer's data shall include cross-sectional and material properties, uplift resistance, and diaphragm strength.
B. Shop Drawings: Submit detailed shop drawings showing type of deck, complete layout, attachment details, closures, edge strips, supplementary framing, and all other accessories. Show supporting members, splices, lap lengths, openings, and deck dimensions on layout. Indicate deck gauge, coating, swaging, and type of side lap. Show attachment using standard AWS welding symbols and weld washer requirements. Show methods of installing hangers, flashing and accessories, including reinforcement at openings.

C. Insurance Certification: Assist Architect and Owner in preparation and submittal of roof installation acceptance certification as necessary in connection with fire, windstorm, and extended coverage insurance.

D. LEED Documentation Submittals: These submittals are to be submitted one time with related submittals and/or if any changes exist during construction.
   1. Credit MR4.1 and 4.2: Provide a final summary at the end of construction documenting total recycled content in building materials.
      a. Product Data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
      b. Letter Template as appropriate to submittal content with actual values input.
   2. Credit MR5 and 5.2: Provide a final summary at the end of construction documenting total regional materials used:
      a. Product Data indicating location of material manufacturer for regionally manufactured materials.
         1) Include statement indicating cost, and distance from manufacturer to Project for each regionally manufactured material.
         2) Include statement indicating cost, and distance from point of extraction, harvest, or recovery to Project for each raw material used.
      b. Letter Template as appropriate to submittal content with actual values input.

1.6 PRODUCT HANDLING

A. Deliver, store, handle and install steel deck and accessories so as not to damage or deform. Failure to wirebrush and paint rusted areas immediately upon detection shall be cause for rejection. Stack deck, stored at site, on platforms or pallets and cover with tarpaulins or other suitable covering to provide weathertight enclosure, while affording proper air circulation. Do not use deck for storage or as a working platform until sheets have been securely fastened in position. Do not damage or overload during entire construction period. Any deck damaged in shipping, unloading, or erection is cause for rejection.

1.7 INSPECTION

A. Welded decking in place is subject to inspection and testing by Owner's testing laboratory. Expense of removing and replacing portions of decking for testing purposes will be borne by Owner if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work. Cost of such removal and replacement shall be borne by Contractor.

PART 2 PRODUCTS

2.1 MATERIALS

A. All products shall be extracted, harvested or recovered and manufactured from within 500 miles of Project. All reinforcing bar and steel components shall contain minimum 95% recycled content, all raw materials shall be manufactured and extracted within 500 miles of Project site and all recycled materials shall be manufactured and recovered within 500 miles of the Project site.
B. Roof Deck: Shall be steel deck of type, depth, and gauge shown on Drawings and shall conform to Steel Deck Institute's Roof Deck Specifications. Provide deck units with nested side laps. Sheet steel for galvanized roof deck and accessories shall conform to ASTM A 653, structural quality, grade 33 or higher. Galvanizing shall conform to ASTM A 653 with a minimum coating class of G60.

C. Other manufacturers may be used only with Architect/Engineer approval.

D. Provide 18 gauge steel plates at vents and other openings in deck and 14 gauge sump pans at roof drains. Provide 18 gauge metal closures where indicated or required.

E. Welding rods shall conform to American Welding Society "Specification for Iron and Steel Arc-Weld Electrodes." Use welding electrodes recommended by deck manufacturer.

F. Screws shall be self-drilling "TEKS" screws, by Illinois Tool Works, Inc., Buildex Div., of size indicated on Drawings.

PART 3 EXECUTION

3.1 ERECTION

A. General: Do not undertake laying of deck units until supporting members are completely in place. Lay and align units so as to maintain required number of units shown on shop drawings and to prevent stretching or contracting of sidelaps. Weld deck units to structural supports. End laps shall be a minimum of 2" and shall occur over supports.

B. Deck units shall be installed continuous over 3 or more spans.

3.2 CONNECTIONS

A. Size, spacing, and location of welds and side lap connections shall be as indicated on Structural Drawings.

B. Welding sequence and procedure shall be coordinated with placing of units, and shall be shown on shop drawings prior to proceeding with work.

C. Weld metal fillers, sump pans, and closure pieces to deck.

D. Deck metal surrounding welds shall be completely intact after welding. Blow holes will be cause for rejection of work. Weld metal shall penetrate all plies of deck material at end laps and side joints and fuse to supporting steel. Weld through weld washers where required by note on the Drawings.

E. Field Painting: After erection, scarred areas on both sides of deck, including welds, weld scars, bruises, and rust spots, shall be wire brushed and touch-up painted. Touch-up deck with same type of coating as specified for deck.

3.3 WORKMANSHIP

A. Piecing and patching deck shall be avoided. Do not install deck units which are kinked, bent, torn, rusted or significantly damaged in any way.

B. Improper nesting along sides or ends shall not be permitted. Swaged ends, if used, must be placed on the correct side of non-swaged ends, so that units nest tightly.

C. Plan and lay out units so there is adequate contact bearing at all perimeter supports. Check frequently for squareness at intermediate strips, to assure proper fitting and connection of the last strip adjacent to walls, parapets, eaves and ridges. Where a rib occurs at an exterior side support, carefully bend the rib down to bear flat on the support and weld as specified.
D. Deck units having excessive penetrations shall be removed and replaced or have additional support angles installed.

E. Install all necessary accessories and provide a finished surface suitable for application of insulation and roofing. Deck units or installation deemed by Architect to be unsatisfactory shall be immediately removed and replaced or otherwise corrected, as directed by Architect, at no additional cost to Owner.

3.4 MISCELLANEOUS

A. Ceilings, lights, ducts and miscellaneous equipment shall not be hung directly from metal roof deck.

END OF SECTION
SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Interior load-bearing wall framing.
   2. Exterior non-load-bearing wall framing.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
   2. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
   3. Division 9 Section "Gypsum Board Shaft-Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
      b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
      c. Floor Joist Framing: Vertical deflection of 1/480 for live loads and 1/360 for total loads of the span.
   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
      a. Upward and downward movement of 1 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."

2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates: Copies of certificates for welding procedures and personnel.

D. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements.

E. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips.
7. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: Evidence of cold-formed metal framing’s compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
D. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized coating thickness.

E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

F. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.


H. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

I. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

J. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

   1. Allied Studco.
   2. AllSteel Products, Inc.
   4. Clark Steel Framing.
   5. Consolidated Fabricators Corp.; Building Products Division.
   6. Craco Metals Manufacturing, LLC.
   7. Custom Stud, Inc.
   8. Dale/Incor.
   10. Dietrich Metal Framing; a Worthington Industries Company.
   11. Formetal Co. Inc. (The).
   12. Innovative Steel Systems.
2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade: As required by structural performance.
   2. Coating: G90; G90 (Z275) at masonry curtain-wall framing.

B. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: As required by structural performance.
   2. Coating: G90.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0329 inch.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel studs.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0329 inch.

D. Steel Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
   1. Minimum Base-Metal Thickness: 0.0329 inch.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0329 inch.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel studs.

C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Flange Width: As required to accommodate upward or downward deflection of primary structure.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers, knee braces, and girts.
   9. Joist hangers and end closures.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).
3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistant materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistant materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Provide supplementary framing, blocking, and bracing where metal framing systems are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, metal roof, wall, and soffit panels, and similar work requiring attachment. Where type of supplementary support is not otherwise indicated, comply with cold-formed metal framing manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item to be supported.

D. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

E. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

F. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

G. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

H. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

I. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

J. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

K. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As shown on Shop Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding 1/8 inch (3 mm) between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As shown on Shop Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.

2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced as shown on shop drawings. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.

2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As shown on Shop Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.

2. Install double deep-leg deflection tracks and anchor outer track to building structure.

3. Connect vertical deflection clips to bypassing and infill studs and anchor to building structure.

4. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
a. Install solid blocking at centers indicated on Shop Drawings.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

4. Bridging: Proprietary bridging bars installed according to manufacturer’s written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).

2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches (51 mm) from abutting walls, and as follows:

1. Joist Spacing: As shown on Shop Drawings.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.

2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.7 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.
C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000
SECTION 055000 - METAL FABRICATIONS

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

B. This Section includes the following:

1. Steel ladders.
2. Loose steel lintels.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
6. Miscellaneous metal trim including metal edging.
7. Pipe bollards.
8. Ships Ladder

C. Related Sections include the following:

1. Division 5 Section "Structural Steel" for structural-steel framing system components.
2. Division 5 Section "Metal Stairs" for metal-framed stairs with metal pan, metal plate, or grating treads.
3. Division 5 Section "Gratings" for metal gratings.
4. Division 5 Section "Pipe and Tube Railings" for metal pipe and tube handrails and railings.
5. Division 6 Section "Rough Carpentry" for metal framing anchors and other rough hardware.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. Provide templates for anchors and bolts specified for installation under other Sections.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Quality procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

C. Galvanizing: Qualify procedures and personnel according to the following:
   1. ASTM A 123 “Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”.
   2. ASTM A 384 “Specification for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies”.
   3. CSA G 164 “Galvanizing of Irregularly Shaped Articles”.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
C. Revise paragraph above or below to Type 316L if required for corrosive environments.
D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
F. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
G. Round steel tubing and pipe are sized differently. Tubing is designated by OD and wall thickness. Pipe is designated by nominal pipe size and weight or schedule number. See Evaluations.
H. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
J. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

K. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 ALUMINUM


2.4 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.


C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.


E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).


I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1) Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.
2.6 **GROUT**

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 **CONCRETE FILL**

A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

2.8 **FABRICATION, GENERAL**

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.9 **STEEL SHIPS LADDER**

A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.

1. Comply with ANSI A14.3, unless otherwise indicated.
2. Factory welded handrails of 1 1/2" x 14 ga. square tubing.

3. 10" structural channel stringers.
4. Fire proof construction.
5. Standard finish gray enamel.
7. Tread depth is 6".

B. Galvanize ladders, including brackets and fasteners, in the following locations:
   1. Exterior.
   2. Interior.

2.10 LOOSE STEEL LINTELS
A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
B. Weld adjoining members together to form a single unit where indicated.
C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm), unless otherwise indicated.
D. Galvanize loose steel lintels located in exterior walls.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS
A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
   1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
   2. Furnish inserts if units must be installed after concrete is placed.
C. Galvanize miscellaneous framing and supports where indicated.

2.12 MISCELLANEOUS STEEL TRIM INCLUDING METAL EDGINGS
A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.
B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.
C. Galvanize miscellaneous steel trim in the following locations:
   1. Exterior.
   2. Interior, where indicated.

2.13 PIPE BOLLARDS
A. Fabricate pipe bollards from Schedule 80 steel pipe.
2.14 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.15 STEEL AND IRON FINISHES

A. GALVANIZING

1. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to the following:
   a. ASTM A 123/ A 123M.
   b. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

2. Fill vent holes and grind smooth after galvanizing.

3. Minimize distortion and warpage of steel members being galvanized by following recommendations according to ASTM A 384 – 76 and CSA Specification G 164.

4. Do not apply galvanizing using double- dip or progressive processes without Architect’s or Engineer’s written approval.

5. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:


7. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

   a. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

   b. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.16 STEEL LADDERS

C. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.

8. Comply with ANSI A14.3, unless otherwise indicated.

9. For elevator pit ladders, comply with ASME A17.1.

D. Siderails: Continuous, 1/2 by 2-1/2 inch (12 by 64 mm) steel flat bars, with eased edges, spaced 18 inches (457 mm) apart.

E. Bar Rungs: 3/4 inch (19 mm) square steel bars, spaced 12 inches (300 mm) o.c.

1. Fit bar rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.

2. Provide nonslip surfaces on top of each bar rung by coating with abrasive material metallically bonded to rung by a proprietary process.

   a. Products: Subject to compliance with requirements, products which may be incorporated in the Work include the following:

      1) Mebac, Harsco Industrial IKG, a Division of Harsco Corporation 800-234-8417
         www.harscoikg.com

      2) SlipNOT, SlipNOT Metal Safety Flooring, Division of W.S. Molnar Company 800-754-7668
         www.slipnot.com

   b. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3.

   G. Galvanize ladders, including brackets and fasteners, in the following locations:
PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING PIPE BOLLARDS

A. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) greater than OD of bollard. After bollards have been inserted into holes, fill annular space surrounding bollard solidly with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

B. Fill bollards solidly with concrete, mounding top surface.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."
C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Steel pipe and tube handrails and railings.
2. Stainless-steel pipe and tube handrails and railings.

B. Related Sections include the following:

1. Division 5 Section "Metal Stairs" for steel pipe handrails and railings included with metal stairs.

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:

2. Stainless Steel: ASCE 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
4. Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."

B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections:

1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
   a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
   b. Uniform load of 50 lbf/ft. (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf/ft. (1460 N/m) applied vertically downward.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:
   a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
   b. Uniform load of 50 lbf/ft. (730 N/m) applied in any direction.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.

4. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.

C. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

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

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer’s product lines of mechanically connected handrails and railings.
   2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work.
   1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
   1. 6-inch- (150-mm-) long sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
   2. Fittings and brackets.

D. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Product Test Reports: From a qualified testing agency indicating products comply with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design, and extent.

B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.

1.6 STORAGE

A. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION
A. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.9 SCHEDULING

A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

B. Stainless Steel: Grade or type designated below for each form required:
   1. Tubing: ASTM A 554, Grade MT 304.
   2. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.

C. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:
   1. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is required by structural loads.
   2. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
   1. Brackets: Subject to compliance with requirements, provide the following:
      a. Aluminum: Series 376A; Julius Blum and Co. 1-800-526-6293 www.juliusblum.com
      c. Stainless Steel: Series 275; Julius Blum and Co. 1-800-526-6293 www.juliusblum.com

2.2 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
   1. For aluminum handrails and railings, use fasteners fabricated from Type 304 or Type 316 stainless steel.
   2. For stainless-steel handrails and railings, use fasteners fabricated from Type 304 or Type 316 stainless steel.
   3. For steel handrails, railings, and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

C. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
   1. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, unless otherwise indicated.
   2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
D. Cast-in-Place and Post installed Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2. Chemical anchors.
3. Expansion anchors.

2.3 PAINT

A. Shop Primers: Provide primers to comply with applicable requirements in Division 9 Section "Painting."

B. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Form changes in direction of railing members as follows:

1. By flush radius bends.
2. Modify subparagraph below if socket-type fittings are required.
3. By inserting prefabricated flush-elbow fittings.
4. By any method indicated above, applicable to change in direction involved.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

E. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
5. Fabricate splice joints for field connection using an epoxy structural adhesive where this is manufacturer's standard splicing method.

F. Welded Connections for Aluminum Pipe: Fabricate pipe handrails and railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

H. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

I. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (12 mm) greater than outside dimensions of post, and steel plate forming bottom closure.

J. For removable railing posts, fabricate slip-fit sockets from steel tube whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

K. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

L. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

M. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

N. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.

O. Fabricate joints that will be exposed to weather in a watertight manner.

P. Close exposed ends of handrail and railing members with prefabricated end fittings.

Q. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

S. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 STAINLESS-STEEL FINISHES

A. Remove or blend tool and die marks and stretch lines into finish.

B. Grind and polish surfaces to produce uniform, directionally textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
2.8 STEEL FINISHES

A. Galvanized Handrails and Railings: Hot-dip galvanize exterior steel and iron handrails and railings to comply with ASTM A 123. Hot-dip galvanize hardware for exterior steel and iron handrails and railings to comply with ASTM A 153/A 153M.

B. Generally retain paragraph below for railings hot-dip galvanized after fabrication.

C. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. For galvanized handrails and railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

E. Preparation for Shop Priming: After galvanizing, thoroughly clean handrails and railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.

F. Apply shop primer to prepared surfaces of handrail and railing components, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Stripe paint edges, corners, crevices, bolts, and welds.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

2. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

3. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).

4. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

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

D. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:

1. Nonshrink, nonmetallic grout.

B. Cover anchorage joint with flange of same metal as post, attached to post as follows:

1. Welded to post after placing anchoring material.

C. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with postinstalled anchors and bolts.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.

3.7 CLEANING

A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."

3.8 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.
SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Rooftop equipment bases and support curbs.
   2. Wood blocking, cants, and nailers.
   3. Wood furring and grounds.
   4. Sheathing.
   5. Plywood backing panels.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NELMA - Northeastern Lumber Manufacturers Association.
   2. NLGA - National Lumber Grades Authority.
   3. SPIB - Southern Pine Inspection Bureau.
   4. WCLIB - West Coast Lumber Inspection Bureau.
   5. WWPA - Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
   3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
   1. Preservative-treated wood.
   2. Fire-retardant-treated wood.
   5. Expansion anchors.
1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

B. Wood Structural Panels:

1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Factory mark panels according to indicated standard.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
   a. Ammoniacal, or amine, copper quat (ACQ).
   b. Copper bis (dimethylthiocarbamate) (CDDC).
   c. Ammoniacal copper citrate (CC).
   d. Copper azole, Type A (CBA-A).

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, top-of-parapet blocking, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches (460 mm) above grade.
4. Wood floor plates that are installed over concrete slabs directly in contact with earth.
5. Exterior plywood at back-of-parapet and similar conditions.
2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where required by authorities having jurisdiction, for all furring, blocking, nailers, and other types of rough carpentry provided at building interior, and where otherwise indicated, provide fire-retardant-treated materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.
3. Use Exterior type for exterior locations and where indicated.
4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

2.4 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Rooftop equipment bases and support curbs.
2. Blocking.
3. Cants.
5. Furring.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content and any of the following species:

1. Mixed southern pine; SPIB.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Hem-fir or Hem-fir (north), Construction or 2 Common Standard or 3 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir, Construction or 2 Common Standard or 3 Common grade; NELMA, NLGA, WCLIB, or WWPA.

D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 SHEATHING


1. Span Rating: Not less than 16/0.
2. Thickness: Not less than 11/32 inch (8.7 mm).

2.6 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch (12.7 mm) thick.
2.7 FASTENERS (Fasteners shall be of 316 Stainless Steel or G90 Hot Dipped Galvanized)

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Standard in first paragraph below covers power-driven staples, nails, P-nails, and allied fasteners.


E. Wood Screws: ASME B18.6.1.

F. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

G. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).

H. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

2.8 MISCELLANEOUS MATERIALS

A. Sheathing Tape: Pressure-sensitive plastic tape for sealing joints and penetrations in sheathing and recommended by sheathing manufacturer for use with type of sheathing required.

B. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

C. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 ASTM D 3498 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

D. Water-Repellent Preservative: NWWD tested and accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

E. Isolation Membrane: Where wood preservative treated wood members come in contact with steel provide isolation membrane.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven fasteners.
5. Table 2304.9.1, "Fastening Schedule," in the International Building Code.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

1. Fire block furred spaces of walls, at each floor level and at ceiling, with wood blocking or noncombustible materials accurately fitted to close furred spaces.

B. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c.

C. Furring to Receive Plaster Lath: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c.

3.4 WOOD STRUCTURAL PANEL INSTALLATION


B. Fastening Methods: Fasten panels as indicated below:

C. Sheathing:

1. Nail to wood framing.
2. Screw to cold-formed metal framing.
3. Space panels 1/8 inch (3 mm) apart at edges and ends.

D. Plywood Backing Panels: Nail or screw to supports.
3.5 SHEATHING TAPE APPLICATION

A. Apply sheathing tape to joints between sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

END OF SECTION 061000
SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Wood Shelving.
   2. Wood cabinets.
   4. Plastic-laminate countertops
   5. Solid-surfacing-material countertops window stool

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

C. This Section does not include premanufactured casework. Refer to Division 12 Sections for premanufactured casework requirements. The Casework is distinguished from the custom millwork specified in this section by model numbers which correspond to predetermined cabinet designs. Refer to the plans for casework model numbers.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

B. Balanced Construction: To achieve balanced construction panels should be absolutely symmetrical from the centerline, i.e., use materials on either side, which contract or expand, or are moisture permeable, at the same rate.

C. For the purposes of this specification and project:
   2. High-Pressure Decorative Laminate (HPDL): Plastic Laminate other than Melamine.
   3. CLS: Thin Plastic Laminate used exclusively for cabinet liner or other “hidden from view” applications, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories, and finishing materials and processes.

B. Product Data: For plywood, high-pressure decorative laminate, thermoset decorative overlay, solid-surfacing material, fire-retardant-treated materials, cabinet hardware and accessories, and finishing materials and processes.

C. Shop Drawings: Comply with AWS Section 1 – Submittals, and, in addition, the following:
   1. Submit one copy of Shop Drawings to AWI Quality Certification Program for review.
   2. Shop Drawings to display AWS certified compliance label on first page.
   3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   4. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
5. Show shelf to cabinet joint details of bottom, intermediate, and top fixed shelves.

D. Samples for Verification: Comply with AWS Section 1 – Submittals, and, in addition, the following:

1. Plastic-laminate-clad panel products: 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
2. Thermoset decorative-overlay surfaced panel products: 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
3. Solid-surfacing materials: 6 inches (150 mm) square.
4. Corner pieces as follows:
   a. Cabinet front frame joints between stiles and rail, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
   b. Miter joints for standing trim.

E. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.

F. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork.


   1. Provide AWS Quality Certification Program certificates indicating that woodwork, including installation, complies with requirements of grades specified.
   2. The Contractor, upon award of the Work, shall register the Work under this Section with the AWI Quality Certification Program 800-449-8811 www.awiqcp.org

E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions” Article.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 8 Section "Door Hardware" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWS quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species and Cut for Transparent Finish: As indicated.

C. Wood Species for Opaque Finish: For standing and running trim: any closed-grain hardwood. For other woodwork: paint-grade birch.

D. Wood Products: Comply with the following:

5. Hardwood Plywood and Face Veneers: HPVA HP-1, 7-ply, minimum Veneer Core.

E. General Cabinet Construction Requirements:

1. Cabinet bases shall be of dimensional lumber.
2. Frames, side panels and structural parts of the cabinets shall be of plywood and/or dimension lumber.
3. Doors, shelves and drawer fronts may have their substrate of any wood material except particleboard and except medium density and heavy density fiberboards. All fixed shelves shall be full shelf thickness “stop dado” joined to their supports. The full depth of the stop dado joint shall, begin no more than 1-1/2 inch (38 mm) from the face of the shelf and, end at the back of the shelf. The joint shall be continuous.

F. Thermoset Decorative Overlay (TDO) (Melamine): Particleboard complying with ANSI A208.1, Grade M-2, or medium-density fiberboard complying with ANSI A208.2, Grade MD, with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1. Use only at interiors of cabinets where melamine overlay will be part of balanced construction (melamine both sides). Where high-pressure decorative laminate is installed, do not apply CLS or TDO on the opposite side of the panel. Do not apply TDO to the exterior of cabinets.

G. High-Pressure Decorative Laminate (Plastic Laminate): NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard. Use at exteriors of cabinets and at interiors of cabinets where necessary to achieve balanced panel construction.
1. Manufacturer: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
   a. Formica Corporation 800-367-6422 www.formica.com
   c. Lamin-Art, Inc. 800-323-7624 www.laminart.com
   d. Pionite Decorative Surfaces 800-746-6483 www.pionite.com
   e. Wilsonart International, Inc., a Division of Illinois Tool Works Inc. 800-433-3222 www.wilsonart.com

H. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:
   3. Hardwood Plywood: HPMA FE.

   1. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) ABA Industries 814-629-7577 www.solitexsurfaces.com
         2) Avonite Surfaces 800-354-9858 www.avonitesurfaces.com
         3) Cheil Industries Inc., a Division of Samsung www.samsung.cii.samsung.co.kr
         4) Formica Corporation 800-367-6422 www.formica.com
         5) Meganite, Inc. 866-634-2648 www.meganite.com
      b. Type: Standard type, unless Special Purpose type is indicated.
   2. Colors and Patterns: Match Architect's samples.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.
   1. Do not use treated material that does not comply with requirements of referenced woodworking standard or that is warped, discolored, or otherwise defective.
   2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.

B. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread rating of 25 or less and smoke-developed rating of 25 or less per ASTM E 84.
   1. For panels 3/4 inch (19 mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: density, 45-lb/cu. ft (720-kg/cu. m); modulus of rupture, 1600 psi (11 MPa); modulus of elasticity, 300,000 psi (2000 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 lbf (1100 N) and 225 lbf (1000 N), respectively.
   2. For panels 13/16 to 1-1/4 inches (20 to 32 mm) thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: density, 44-lb/cu. ft (705-kg/cu. m); modulus of rupture, 1300 psi (9 MPa); modulus of elasticity, 250,000 psi (1700 MPa); linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 lbf (1100 N) and 175 lbf (780 N), respectively.
   3. Product: Subject to compliance with requirements, provide “Duraflake FR” by Willamette Industries, Inc.

2.3 DISPLAY AND TROPHY CASE ACCESSORIES

A. General: Provide accessory materials associated with custom, built-in display cases, except for items specified in Division 8 Section “Door Hardware.”
B. Hardware:


2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

C. Cabinet Hardware:

3. Patch Hinges (at glass doors): Five knuckle pin type double wrap around design (0.088 inch steel) - Finish to match cabinet pulls.
   a. Five knuckle pin type double wrap around design (.088” steel), ANSI-BHMA standard A156.9, Grade 1. Finish to match cabinet pulls where no color is indicated in the “Color Schedule” or to be the color indicated in the “Color Schedule”.
   b. Three knuckle, nickel-plated cast zinc, institutional grade hinge. ANSI-BHMA standard A156.9, Grade 1.
      1) Basis-of-Design: Aximat 300 Thin Panel Hinge or Aximat Glass Door Hinge, Hafele America Company 888-437-7477 www.hafele.com/us
      2) Provide the number of hinges per door leaf that is recommended by the hinge manufacturer for the given height of the door, except at doors 6’-0” and over in height, provide at least 3 hinges unless more are recommended by the manufacturer. Doors need no catches with the use of these hinges.
4. Casework Hinges (other than at glass doors): Casework manufacturer to select from the two options below:
   1) Five knuckle, stainless steel, institutional grade, 2-3/4 inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1. Finish to match cabinet pulls where no color is indicated in the “Color Schedule” or to be the color indicated in the “Color Schedule”.
      a) Doors 48 inches and over in height have 3 hinges per door.
      b) Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.
   2) Three knuckle, nickel-plated cast zinc, institutional grade hinge. ANSI-BHMA standard A156.9, Grade 1.
      b) Provide the number of hinges per door leaf that is recommended by the hinge manufacturer for the given height of the door, except at doors 6’-0” and over in height, provide at least 3 hinges. If more hinges are recommended by the manufacturer, provide the greater number of hinges. Doors need no catches with the use of these hinges.
      c) Provide black hinges if indicated in “Color Schedule”.
5. Continuous Hinges: #314, 2 inch (51 mm) wide Continuous Hinge, finish to match cabinet pulls, Stanley Security Solutions, Inc. 317-849-2250 www.stanleysecuritysolutions.com
7. Magnetic Catches: Provide for use with five-knuckle hinges (not needed at specified Hafele three-knuckle hinges). If three-knuckle hinges different from those specified are used, coordinate with the hinge manufacturer to determine if the substitute hinges are self-catching. If this is the case, catches are not required. If the substitute hinges are not self-catching, the specified catches shall be provided.
a. 918 Magnetic Catch, aluminum satin finish, Knape & Vogt Manufacturing Company 800-253-1561
   www.knapeandvogt.com
b. #710300, clear coated aluminum, Stanley Security Solutions, Inc. 317-849-2250
   www.stanleysecuritysolutions.com

8. Drawer Slides for Light and Medium Duty Drawers: Full extension ball bearing 100 lbs. load rated with
   lever disconnect and positive outstop preventing inadvertent drawer removal.
a. 3832, Accuride International Inc. 562-903-0200 www.accuride.com

9. Drawer Slide for File Drawer and Wide Heavy Duty Drawers: Full extension ball bearing 150 lbs. load
   rated with rail mount, hold-in detent, progressive movement and positive outstop preventing inadvertent
   drawer removal.
a. 4032, Accuride International Inc. 562-903-0200 www.accuride.com
b. 8500 Heavy-Duty Lateral File Slide, Knape & Vogt Manufacturing Company 800-253-1561
   www.knapeandvogt.com

10. Label Holders: 704 Drawer Label Holder, 3-1/2 inch W by 1-3/4 inch H, anochrome finish, Knape & Vogt
    Manufacturing Company 800-253-1561 www.knapeandvogt.com

11. Locks: Surface mounting, cylinder length as required for application intended, supply with standard
    accessories and two keys.
b. #6810 Million Lock, Sugatsune America, Inc. 800-562-5267 www.sugatsune.com
c. C8178, pin tumbler, CompX National, Division of CompX Security Products 864-297-6655
    www.compxnet.com

12. Grommets: XG Flip-Top Series, 3 inch (76 mm), color as selected by Architect from manufacturer’s full range
    of standard colors, Doug Mockett & Company, Inc. 800-523-1269 www.mockett.com

D. Accessory Materials:

1. Hang Rods: 770-5 Heavy Duty Round Tubing, 1 5/16 inch (33 mm) O.D., satin chrome finish steel;
   768 Adjustable Center Hangers; 766 Flange, Knape & Vogt Manufacturing Company 800-253-1561
   www.knapeandvogt.com

2. Shelf Brackets and Standards: 180 Series Regular-Duty Brackets; 80 Series Regular-Duty Standards;
   size as required for shelves, Knape and Vogt Manufacturing Company 800-253-1561
   www.knapevogt.com

3. Mop Racks: Grip All, Model #WM-936, as manufactured by Walton-March, Inc., as distributed by
   Craine Chemical Co. 214-358-3301.

4. Pegboard: 1/4" thick, tempered hardboard, S1S; size as indicated on Drawings.

5. Single Prong Coat Hooks: 572 Coat and Hat Hook, aluminum, Ives, Division of Ingersoll Rand
   Company 877-613-8766 www.ives.ingersollrand.com

6. Double Prong Coat Hooks: 580 Ceiling Hook, cast aluminum, Ives, Division of Ingersoll Rand
   Company 877-613-8766 www.ives.ingersollrand.com


8. L-Shelf Brackets: 204 Series Reinforced L-Bracket, Knape & Vogt Manufacturing Company 800-253-
   1561 www.knapeandvogt.com

E. For concealed hardware, provide manufacturer’s standard finish that complies with product class
   requirements in BHMA A156.9.

2.5 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent
   moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide
   nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as
   required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.6 FABRICATION, GENERAL

A. Interior Woodwork Grade: AWS Grade: Custom, unless otherwise indicated.
B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).
2. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).

E. Fixed Shelves: Fixed shelves shall be fastened to cabinet bodies with full-shelf thickness “Stop Dado” joints. The dado shall stop no farther than 1-1/2 inch (38 mm) from the edge of the vertical support. The dado shall not begin closer than 1 inch (25 mm) from the edge of the vertical support. The depth which the dado cut shall extend into the vertical shelf support shall be no more than half of the thickness of the vertical support. The joint shall be glued for its entire length and all the surfaces of the joint shall be fully glued with no fraction of the joint’s “shelf to support” surfaces void of glue.

F. Supported Shelves Up To 32 inch (813 mm) Span: Adjustable and fixed shelves with end supports only, and end-to-end spans shorter than or equal to 32 inches (813 mm), shall be 3/4 inch (19 mm) minimum thick. Fixed shelves of end-to-end lengths shorter than or equal to 32 inches (813 mm), with support along at least one of their long edges, shall also be 3/4 inch (19 mm) minimum thick.

G. Supported Shelves, 32 inch (813 mm) to 42 inch (1,067 mm) Span: Adjustable and fixed shelves with end supports only, and end-to-end spans between 32 inches (813 mm) and 42 inches (1,067 mm), shall be 1 inch (25 mm) minimum thick. Fixed shelves of end-to-end lengths between 32 inches (813 mm) and 42 inches (1,067 mm), with support along at least one of their long edges, shall also be 1 inch (25 mm) minimum thick.

H. Adjustable Supports:

1. Multiple Hole Supports: Adjustable shelves shall be supported by the “Multiple Holes” method with three columns of holes to allow three supports at each end of a shelf. The front and back shelf supports shall be the Basis-of-Design indicated below. The middle support shall be a metal support which allows for aligned support between the two different support designs [metal (middle) and plastic (ends)]. Other AWS accepted methods of adjustable shelf support will not be allowed, including the “surface mounted standards” method and the “recessed standards” method. The front and back supports for the adjustable shelves shall be plastic shelf supports.

   a. Basis-of-Design: Dual Peg Locking Tongue Support, Clear, 5mm x 3/4 inch (19 mm) or 1 inch (25 mm), Model # 3220CL, Bainbridge Manufacturing, Inc. 800-255-4702 www.bainbridgemfg.com

I. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

J. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

   1. Seal edges of openings in countertops with a coat of varnish.

K. Install glass to comply with applicable requirements in Division 8 Section “Glazing” and in GANA’s “Glazing Manual.” For glass in wood frames, secure glass with removable stops.

2.7 PLASTIC-LAMINATE CABINETS

A. Quality Standard: Comply with AWS Section 10 – Casework.

B. AWS Grade: Custom.

C. Provide laminate covered panels of balanced construction for all work provided and controlled under this specification section. Panels with one surface finished and the other not finished, will not be allowed. Panels with both sides of panels finished, but not of balanced construction, will not be allowed. Adjacent panels or
panels of more than one panel thickness must be glued together, or each substrate panel must have both surfaces covered with laminate before being located in final plan configuration.

D. AWS Type of Cabinet Construction: Reveal overlay.

E. Panel Product for Exposed Surfaces: <Hardwood Medium Density Overlay> <7-ply, minimum, Hardwood Veneer Core plywood>.

F. Laminate Cladding for Exposed Surfaces (Exteriors of cabinets with and without doors and drawers, interiors of cubbies and cabinet compartments without doors): High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: HGS.
2. Postformed Surfaces: HGP.
3. Vertical Surfaces: VGS.
5. Thermoset Decorative Overlay (Melamine) and HPDL - Grade CLS, will not be allowed at exposed surfaces.

G. Materials for Semiexposed Surfaces:

1. For semi-exposed backs of panels (visible from the inside of the cabinet) with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate:
   a. Grade VGS where cabinets are freestanding (with the back is not against a wall), or where cabinet backs are against a low wall and the back is partially visible.
   b. Grade CLS or Thermoset Decorative Overlay (Melamine) where cabinet back are against walls.

H. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Match color, pattern, and finish as indicated by laminate manufacturer's designations for these characteristics.

2.8 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Comply with AWS Section 11 – Countertops for requirements for high-pressure decorative laminate countertops <and window stools>. At countertops with sinks or other plumbed fixtures or accessories provide 7-ply, minimum, veneer core hardwood plywood subtop. OVERLAY PLYWOOD AND PARTICLEBOARD subtops are not acceptable. Unless otherwise indicated, provide one-piece integral top and splash.

B. High-Pressure Decorative Laminate Grade: HGS.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Match color, pattern, and finish as indicated by manufacturer's designations for these characteristics.

D. Edge Treatment: Same as laminate cladding on horizontal surfaces.

2.9 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Grade: <Premium> <Custom> <Economy>.

B. Solid-Surfacing-Material Thickness: 1/2 inch (13 mm).

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Match color, pattern, and finish as indicated by manufacturer's designations for these characteristics.

D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
1. Fabricate tops with shop-applied edges of materials and configuration indicated.
2. Fabricate tops with shop-applied backsplashes

2.10 SHOP FINISHING

A. Quality Standard: Comply with AWS, unless otherwise indicated.
   1. Grade: Provide finishes of same grades as items to be finished.

B. General: Shop finish transparent finished interior architectural woodwork at fabrication shop as specified in this Section. Refer to Division 9 Section "Painting" for finishing opaque finished architectural woodwork.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
   1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.

D. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523:
   1. AWS Finish System TR-4: Conversion varnish.
   2. Staining: Match approved sample for color.
   3. Wash Coat for Stained Finish at Closed-Grain Wood: Apply a vinyl wash coat before staining and finishing to woodwork made from closed-grain wood, or to any woodwork made from wood with a combination of end-grain wood and any other grain.
   4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
   5. Sheen: Satin, 30-50 gloss units.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packaging and.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWS for the items specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with recommendations of chemical treatment manufacturer, including those for adhesives used to install woodwork.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96 inch (3 mm in 2400 mm) sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.
3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1 inch (25 mm) penetration into wood framing, blocking, or hanging strips and No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
4. Key cabinet (millwork) locks alike within each room and differently from room to room.
   a. Provide 4 master keys which can operate all cabinet (millwork) locks throughout the areas receiving new cabinets (millwork).

G. Countertops and Window Stools: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop or window stool.

1. Install countertops <and window stools> with no more than 1/8 inch in 96 inch (3 mm in 2400 mm) sag, bow, or other variation from a straight line.
2. Secure backsplashes to countertops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
3. Caulk space between countertop backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
4. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 40 23
SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Cold-applied, asphalt emulsion dampproofing.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified, including data substantiating that materials comply with requirements for each dampproofing material specified. Include recommended method of application, recommended primer, number of coats, coverage or thickness, and recommended protection course.

1. Certification by dampproofing manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed bituminous dampproofing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain primary dampproofing materials and primers from one source and by a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

1.5 PROJECT CONDITIONS

A. Substrate: Proceed with dampproofing only after substrate construction and penetrating work have been completed.

B. Weather Limitations: Proceed with dampproofing only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2. Cold-Applied, Asphalt Emulsion Dampproofing long-fiber Fibrated Product: Hydrocide 700 by BASF Building Systems or equal.

2.2 BITUMINOUS DAMPPROOFING

A. General: Provide products recommended by manufacturer for designated application.

B. Cold-Applied, Asphalt Emulsion Dampproofing: Asphalt-based emulsions recommended by the manufacturer for dampproofing use when applied according to the manufacturer's instructions.
   1. Trowel applied, long fiber reinforced, complying with ASTM D1227, Type 2, Class I and ASTM D1187, Type 1.

2.3 MISCELLANEOUS MATERIALS

A. Primer: Asphalt primer complying with ASTM D 41, for asphalt-based dampproofing.

B. Glass Fabric: Woven glass fabric, treated with asphalt, complying with ASTM D 1668, Type I.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown.

C. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at construction joints.

D. Install separate flashings and corner protection stripping, as recommended by prime materials manufacturer, where indicated to precede application of dampproofing. Comply with details shown and with manufacturer's recommendations. Pay particular attention to requirements at building expansion joints, if any.

E. Prime substrate as recommended by prime materials manufacturer.

F. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work by masking or otherwise protecting adjoining work.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's recommendations except where more stringent requirements are indicated and where Project conditions require extra precautions to ensure satisfactory performance of work.

B. Application: Apply dampproofing to the following surfaces.
   1. Exterior surface of inside wythe of double-wythe, exterior masonry walls, and at exterior gypsum sheathing walls, above grade, to prevent water-vapor penetration through the wall.
   2. Where elsewhere indicated on the Drawings.

C. Cold-Applied Asphalt Dampproofing: For interior and exterior surfaces, provide emulsified asphalt vapor retarding dampproofing materials.

D. Reinforcement: At changes in plane, perimeter of openings, or where otherwise shown as "reinforced," install lapped course of glass fabric in first coat of dampproofing compound before it thickens.

E. Bituminous Cant Strips: Install 2-by-2-inch (50-by-50-mm) cant strip of bituminous grout at base of vertical dampproofing where it meets horizontal surface.
F. Apply vertical dampproofing down walls from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when the Project is completed.

3.3 PROTECTION AND CLEANING

A. Protect exterior, below-grade dampproofing membrane from damage until backfill is completed. Remove overspray and spilled materials from surfaces not intended to receive dampproofing.

END OF SECTION 071113
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 clear water-repellent coatings for the following vertical and nontraffic horizontal surfaces:

1. Stone Masonry
2. Brick masonry.
3. Concrete unit masonry (unpainted and unglazed).

B. Related Sections include the following:

1. Division 3 Sections for concrete work including floor sealers and curing agents, precast concrete, and concrete restoration and cleaning.
2. Division 4 Sections for brick, concrete unit masonry, stone, and masonry and stone restoration and cleaning.
3. Division 7 Section “Joint Sealants” for joint sealants.
4. Division 9 Section “Painting” for paints and coatings.

1.3 SUBMITTALS

A. Product Data: Include manufacturer’s specifications, surface preparation and application instructions, recommendations for water repellents for each surface to be treated, and protection and cleaning instructions. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.

B. Samples: Of each substrate indicated to receive water repellent, 12 inches (300 mm) square, with specified repellent treatment applied to half of each sample.

C. Applicator Certificates: Signed by manufacturer certifying that the applicator complies with requirements.

D. Certification by water repellent manufacturer that products supplied comply with local regulations controlling use of VOC’s.

E. Material Test Reports: Indicate and interpret test results for compliance of water repellents with requirements indicated.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who employs only persons trained and approved by water repellent manufacturer for application of manufacturer’s products.

B. Regulatory Requirements: Comply with applicable rules of pollution-control regulatory agency having jurisdiction in Project locale regarding VOCs and use of hydrocarbon solvents.

C. Field Samples: Architect will select one representative surface for each substrate to receive water repellents. Apply water repellent to each substrate, with either partial or full coverage as directed. Comply with application requirements of this Section.

1. Obtain Architect’s approval of field samples before applying water repellents.
2. Maintain field samples during construction in an undisturbed condition as a standard for judging the completed Work.

1.5 PROJECT CONDITIONS
A. Weather and Substrate Conditions: Do not proceed with application of water repellent under any of the following conditions, except with written instruction of manufacturer:

1. Ambient temperature is less than 40 deg F (4.4 deg C).
2. Concrete surfaces and mortar have cured for less than 28 days.
3. Rain or temperatures below 40 deg F (4.4 deg C) are predicted within 24 hours.
4. Application is earlier than 24 hours after surfaces have been wet.
5. Substrate is frozen or surface temperature is less than 40 deg F (4.4 deg C).
6. Windy condition exists that may cause water repellent to be blown onto vegetation or surfaces not intended to be coated.

1.6 WARRANTY

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

B. Special Warranty: Submit a written warranty, executed by the applicator and water repellent manufacturer, covering materials and labor, agreeing to repair or replace materials that fail to provide water repellency within the specified warranty period. Warranty does not include deterioration or failure of coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new joints and cracks in excess of 1/16 inch (1.5 mm) wide, fire, vandalism, or abuse by maintenance equipment.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

1. Siloxanes: With more than 3.3 lb/gal. (400 g/L) VOCs.
   b. Diedrich 303S-10 Silox Seal, Diedrich Technologies, Inc. 800-323-3565 www.diedrichtechnologies.com
   c. Euco-Guard 100, The Euclid Chemical Company 800-321-7628 www.euclidchemical.com
   d. Klere-Seal 908-SX, Pecora Corporation 800-523-6688 www.pecora.com
   e. Weather Seal Siloxane-PD, ProSoCo, Incorporated 800-255-4255 www.prosoco.com

2. Siloxanes: With 3.3 lb/gal. (400 g/L) VOCs or less.

2.2 WATER REPELLENTS

A. Siloxanes: Penetrating water repellent. Alkylalkoxysiloxanes that are oligomeric with alcohol, ethanol, mineral spirits, water, or other proprietary solvent carrier.

B. VOC-Complying Water Repellents: Products complying with local regulations controlling use of VOCs, as certified by manufacturer.

PART 3 - EXECUTION
3.1 PREPARATION

A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to repellent manufacturer's written instructions, to ensure surface is sufficiently dry.
   1. Formed Concrete: Remove oil, curing compounds, laitance, and other substances that could prevent adhesion or penetration of water repellents.
   2. Clay Brick Masonry: Clean clay brick masonry per ASTM D 5703.

B. Test for pH level, according to water repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.

C. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.

D. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
   1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.

3.2 APPLICATION

A. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated.

B. Apply a second saturation spray coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized technical service representative to inspect and approve the substrate before application and to instruct the applicator on the product and application method to be used.

3.4 CLEANING

A. Protective Coverings: Remove protective coverings from adjacent surfaces and other protected areas.

B. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 19 00
SECTION 072100 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Concealed building insulation.
2. Loose-fill building insulation.
3. Safing Insulation.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for insulation installed in cavity walls and masonry cells.
2. Division 7 Section "Metal Wall Panels and Soffit Panels.
3. Division 9 Section “Gypsum Board Assemblies” and “Gypsum Board Shaft-Wall Assemblies” for installation in metal-framed assemblies of insulation specified by reference to this Section.

1.3 DEFINITIONS

A. For the purpose of this section the terms Batt and Blanket, when referencing thermal or acoustical insulation, are herein understood to be synonymous.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

3. Below is a pass-fail test for measuring combustibility that is referenced in codes to determine if elementary products are noncombustible. Only selected unfaced mineral-fiber insulation and unfaced cellular glass insulation pass this test. See Evaluations.
1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Glass-Fiber Insulation (6”, R-19 at exterior walls, 4”, R-13 at interior walls):
   1) CertainTeed Corporation. (www.certainteed.com) (800-233-8990)
   2) Johns Manville Corporation. (www.jm.com) (800-654-3100)
   3) Owens Corning. (www.owens-corning.com) (800-438-7445)

2. Glass-Fiber Insulation – White Vinyl Faced at Gym (6”, R-19 at exterior walls)
   1) CertainTeed Corporation. (www.certainteed.com) (800-233-8990)
   2) Johns Manville Corporation. (www.jm.com) (800-654-3100)
   3) Owens Corning. (www.owens-corning.com) (800-438-7445)

3. Slag-Wool-/Rock-Wool-Fiber Insulation:
   1) Owens Corning. (www.owens-corning.com) (800-438-7445)
   2) Thermafiber. (www.thermafiber.com) (888-834-2371)

4. Rigid Board Insulation (1”, R-5 per inch, Reference Drawings):
   1) Dow Building Solutions (www.building.dow.com) (866-583-BLUE (2583))
   2) Owens Corning. (www.owens-corning.com) (800-438-7445)
   3) Thermafiber. (www.thermafiber.com) (888-834-2371)

   A. Adhesive: Type recommended by insulation board manufacturer for application indicated. See Division 7 Section “Bituminous Dampproofing”. Coordinate and insure compatibility of adhesive type bituminous dampproofing with insulation board manufacturer for application indicated.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Unfaced Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from glass; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

C. Unfaced, Slag-Wool-/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indices of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following density, type, thermal resistivity, and fiber color:

   1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).

   2. Fiber Color: Regular color, unless otherwise indicated.

2.3 SAFING INSULATION AND ACCESSORIES

A. Semi-Refractory Fiber Board Safing Insulation: Semi-rigid boards designed for use as a fire stop at openings between edge of slab and exterior wall panels, top of interior partition and metal floor deck/roof deck,
miscellaneous floor, roof, and wall penetrations, produced by combining semi-refractory mineral fiber manufactured from slag with thermosetting resin binders to comply with ASTM C 612, Class 1 and 2; nominal density of 4.0 pcf; passing ASTM E 136 for combustion characteristics; r-value of 4.0 at 75 deg F (23.9 deg C).

B. Calking Compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge opening against penetration of smoke.

C. Safing Clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.

2.4 INSULATION FASTENERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Adhesively Attached, Spindle-Type Anchors:
   1) AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
   2) Eckel Industries of Canada Limited; Stic-Klip Type N Fasteners. 613-543-2967 www.eckel.ca
   3) Gemco; Spindle Type. 800-331-1164 www.gemcoinsulation.com

2. Adhesively Attached, Angle-Shaped, Spindle-Type Anchor:
   1) Gemco; 90-Degree Insulation Hangers. 800-331-1164 www.gemcoinsulation.com

3. Insulation-Retaining Washers:
   1) AGM Industries, Inc.; RC150.
   2) AGM Industries, Inc.; SC150.
   3) Gemco; Dome-Cap. 800-331-1164 www.gemcoinsulation.com
   4) Gemco; R-150. 800-331-1164 www.gemcoinsulation.com
   5) Gemco; S-150. 800-331-1164 www.gemcoinsulation.com

4. Insulation Standoff:
   1) Gemco; Clutch Clip. 800-331-1164 www.gemcoinsulation.com

5. Anchor Adhesives:
   1) AGM Industries, Inc.; TACTOO Adhesive.
   2) Eckel Industries of Canada Limited; Stic-Klip Type S Adhesive. 613-543-2967 www.eckel.ca
   3) Gemco; Tuff Bond Hanger Adhesive. 800-331-1164 www.gemcoinsulation.com

B. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.

2. Spindle: Copper-coated, low carbon steel, fully annealed, 0.105 inch (2.67 mm) in diameter, length to suit depth of insulation indicated.

C. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.

2. Spindle: Copper-coated, low carbon steel, fully annealed, 0.105 inch (2.67 mm) in diameter, length to suit depth of insulation indicated.

D. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
   1) Crawlspaces.
   2) Ceiling plenums.
   3) Attic spaces.
   4) Where indicated.

E. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of dimension indicated between face of insulation and substrate to which anchor is attached.

   1. Air Space: 1 inch (25 mm).

F. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

B. Close off openings in cavities receiving poured-in-place insulation to prevent escape of insulation. Provide bronze or stainless-steel screens (inside) where openings must be maintained for drainage or ventilation.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Install glass-fiber blankets in cavities formed by framing members according to the following requirements:

   1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

C. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.

2. Show width of cavity on Drawings.

3. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.

4. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.

5. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

D. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.

1. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel surface. Maintain cavity width of dimension indicated between insulation and spandrel surface. Install insulation where it contacts safing to prevent insulation from bowing under pressure from safing.

E. Place loose, glass-fiber insulation into miscellaneous voids and cavity spaces where shown or as needed to form an air tight thermally secure system. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.5 INSTALLATION OF SAFING INSULATION

A. Install perimeter safing insulation to fill gap between edge of concrete floor slab and back of spandrel panel insulation of exterior curtain-wall systems to comply with fire-containment system manufacturer's written instructions to produce installations with ratings matching those established during fire-test-response testing.

B. At fire rated construction, stuff loose safing insulation into miscellaneous voids and cavity spaces where shown and if not shown, to fill voids at tops of walls, around structural steel penetrations of walls and mechanical/electrical penetrations of walls. Compact to approximately 40% of normal maximum volume, and seal joints and/or surface with calking compound indicated to prevent the passage of smoke.

END OF SECTION 072100
SECTION 07 22 16 – ROOF AND DECK INSULATION

PART 1 – GENERAL

1.1 REFERENCES

A. American Society of Testing Materials (ASTM)
   2. C 209-84 Methods of Testing Insulating Board (Cellulosic Fiber), Structural and Decorative.
   3. C 728-89a Perlite Thermal Insulation Board
   4. D 41-85 Asphalt Primer Used in Roofing and Waterproofing.
   5. D 312-89 Asphalt Used in Roofing.

B. National Roofing Contractors Association (NRCA)
   1. (ANSI/SPRI) (CURRENT YEAR)
   2. ASCE 7 wind uplift criteria, (CURRENT YEAR)

1.2 QUALITY ASSURANCE

A. Regulatory Requirements
   1. Classified by Underwriter's Laboratories (UL) as Class A roof covering.
   2. Follow local, state, and federal regulations, safety standards, and codes.

B. Installation
   1. Installation shall be in accordance with manufacturer's current published application procedures, NRCA general recommendations, and ASCE 7 wind uplift criteria.
   2. Roof system manufacturer's technical specifications shall be considered part of this specification and shall be used as reference for specific application procedures.

1.3 SUBMITTALS

A. Product Data: Submit Manufacturer's product data sheets for each product.

B. Shop Drawings: Layout of roof plan showing tapered design, tapered insulation pattern, direction of slope, amount of slope, spot elevations indicating thicknesses at high and low points.

C. Certification: Submit roof manufacturer's certification in writing that insulation is acceptable as substrate for application of specified roof system.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials in accordance with manufacturer's recommendations.

B. When stored outdoors:
   1. Tarp and shield insulation from moisture and ultraviolet rays.
2. Elevate insulation above substrate four inches minimum.

3. Secure insulation to resist high winds.

4. Distribute insulation stored on roof deck to prevent concentrated loads that would impose excessive stress or stain on deck or structural members. Verify that structure can accommodate additional loading.

5. Wet insulation, or insulation that has been wet but which has dried, may not be used and shall be removed completely and immediately from the job site.

6. Do not double stack bundles of insulation on the roof top.

1.5 SEQUENCING AND SCHEDULING

A. Substrate Acceptance: Roof system manufacturer's representative shall inspect roof deck and associated substrates and provide written acceptance of conditions.

B. Manufacturer's approved roofing contractor shall inspect and approve deck and substrates.

C. Plan roof layout with respect to roof deck slope to prevent rainwater drainage into completed roofing.

D. Do not install more insulation than can be covered with complete roof system in same day.

1.6 PRODUCT CONDITIONS

A. Environmental Requirements:
   1. Apply roofing and insulation in dry weather.
   2. Do not proceed with roof construction during inclement weather or when precipitation is predicted 40% or more possibility.
   3. Do not apply insulation over wet or moist deck or in foggy conditions.
   4. Days with wind speeds of 30 mph or greater shall be considered "Bad Weather" days.

B. Emergency Equipment: Maintain on-site equipment and material necessary to apply emergency temporary seals in the event of sudden storms or inclement weather.

C. Costs for emergency roofing shall be borne by Contractor.

PART 2 – PRODUCTS

2.1 INSULATION

A. All insulation shall be approved in writing by the membrane manufacturer as to thickness, type, and manufacturer. All insulation must be approved for the specific application, Underwriters Laboratory approved, and be listed in the FM Global Approval Guide.

B. Polyisocyanurate Roof Insulation: Insulation shall be rigid polyisocyanurate foam board; thickness and LTTR-value shall be a minimum of 4" = 24; meeting Federal Specification No. HH-I-1972/1 or 2 with 20 psi minimum compressive strength and 2.0pcf minimum density. Board shall be surfaced on two (2) sides with non-asphaltic facer material.

C. Factory Tapered Perlite crickets: Factory cut twenty-four inch by forty-eight inch (24" x 48") perlite board cut to one-half inch (1/2") per foot slope used in conjunction with standard thickness of perlite board to provide positive slope to drains.

D. Glass-Faced Gypsum Roof Board: One layer of one-half inch (1/2") thick "DensDeck Prime", as manufactured by Georgia-Pacific, or a prior-approved equal.

E. Crickets and Saddles: Tapered polyisocyanurate board.
   1. Minimum Slope: ¼" per linear foot.
2. Widths of crickets and saddles are not to exceed 1/3 their lengths, unless otherwise shown on Drawings.

3. Starting Thickness: Zero (0) inches.

F. Cant Strips:

1. Tapered cants of wood at all locations where detailed or where applicable.

2. Size: 4 inches high x 4 inches wide x 5-3/4 inches across diagonal face.

3. Size: 2 inches high x 2 inches wide below overflow scupper locations

G. Glass-Faced Gypsum Roof Board: One layer of five-eighths inch (5/8") thick "DensDeck Prime", as manufactured by Georgia-Pacific, or a prior-approved equal. Provide on exterior porches and canopies. No other insulation is required over non-conditioned spaces.

2.2 BITUMEN (FULLY ADHERED)

A. Shall be ASTM D 312 Type IV extra steep asphalt.

<table>
<thead>
<tr>
<th>Slope</th>
<th>Interply</th>
<th>Top Pour</th>
<th>Backnail</th>
<th>Strap</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - ½&quot; per 12&quot;</td>
<td>Type IV</td>
<td>Type IV</td>
<td>No</td>
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<tr>
<td>½&quot; - 2&quot; per 12&quot;</td>
<td>Type IV</td>
<td>Type IV</td>
<td>Yes</td>
<td>Strap if possible</td>
</tr>
<tr>
<td>2&quot; - 3&quot; per 12&quot;</td>
<td>Type IV</td>
<td>Type IV</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

2.3 ASPHALT ROOF PRIMER

A. Quick-dry asphalt-based primer for priming of asphalt roof surfaces, or approved equal.

- ASTM: D 41
- Flash Point: 105° F
- Viscosity at 80° F (ASTM D 217): 50-60 K.U.
- Weight per gallon: 7.4 pounds
- Drying time (to touch): Min. 4 hours

2.4 ROOFING INSULATION ADHESIVE

A. Shall be a dual component, reaction cure polyurethane adhesive, meeting the following physical properties, or approved equal.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>ASTM D-1622 Free Rise 3.2 lb/cf</td>
</tr>
<tr>
<td>Compressive Strength</td>
<td>ASTM D-1621 Parallel 38 psi @ 6% deflection</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM D 1623 35 psi</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>ASTM D 2843 5.1%</td>
</tr>
<tr>
<td>Closed Cell Content</td>
<td>ASTM D 2856 90% min.; R-value = 3.8 new</td>
</tr>
<tr>
<td>Weight/Gallon (Liquid Components)</td>
<td><em>Part 1</em> Component = 10.32 lbs.</td>
</tr>
<tr>
<td></td>
<td><em>Part 2</em> Component = 8.54 lbs.</td>
</tr>
<tr>
<td></td>
<td><em>Part 1</em> Component = 225 cps</td>
</tr>
<tr>
<td></td>
<td><em>Part 2</em> Component = 275 cps</td>
</tr>
</tbody>
</table>

2.5 FASTENERS (METAL DECK APPLICATION)

A. Fasteners and fastening plates and/or termination bars shall be FM Approved and shall be listed in the FM Global Approval Guide, and as recommended by the insulation/ fastener manufacturer for the specific application to meet the minimal requirements for wind uplift as required by the local jurisdiction and/or FM Global.
B. **Standard Fastener for Steel Applications for 18-24 gauge Steel & Wood Substrates:** Shall be a #14 fastener with a minimum .220 thread diameter and .125 buttress threads and a 30 degree spade point. Fasteners shall be fluorocarbon coated with CR-10 corrosion resistant coating when subjected to 30 Kesternich cycles (DIN 50018) shows less than 15% red rust which surpasses FM Global Approval Standard 4470, or approved equal. All fasteners shall be used in conjunction with the manufacturers approved round pressure plate. Fasteners, plates, and/or bars shall be FM approved and listed in the FM Global Approval Guide.

**PART 3 – EXECUTION**

3.1 **PROTECTION**

A. Provide special protection from traffic on yet to be removed roofing.

B. Provide special protection from traffic on completed work.

3.2 **EXAMINATION AND PREPARATION**

A. Do not install until defects are corrected and deck substrate meets roof system manufacturer’s requirements.

B. Do not apply insulation unless asphalt application temperature, EVT of approximately 375 degrees F to 425 degrees F, can be maintained or when water or moisture is present on substrate. Do not heat asphalt above flashing point, or 525 degrees F.

C. Examine substrate and related surfaces, and verify that there are no conditions such as inadequate anchorage, foreign materials, moisture, ridges, depressions, or other conditions which would prevent satisfactory installation of roof system.

D. Start of work constitutes acceptance of deck substrate and site conditions.

E. Sweep deck substrate clean of dust and debris immediately prior to installation of tapered insulation.

3.3 **INSULATION**

A. Manufacturer’s Instructions: In regard to attachment, the manufacturer's instructions or specifications shall determine the suitability for an application. Installation must meet ASCE 7 criteria and meet local governing building codes.

B. Precautions: The surface of the insulation must not be ruptured due to overdriving of fasteners.

C. Thermal insulation boards shall be laid on the substrate in parallel rows with end joints staggered and butted as close as possible. All joints shall be tight and at the roof perimeter and roof penetrations, insulation shall be cut neatly and fitted to reduce openings to a minimum. All openings one-fourth inch (1/4") or larger shall be filled with insulation.

D. Insulation shall be tapered or feathered at drains and scuppers to provide proper drainage.

E. No more insulation shall be installed than can be covered by the completed roof system by the end of the day or the onset of inclement weather.

F. Tapered insulation and cricket shall be placed in accordance with the drawings and/or as required to minimum of NRCA standards.

3.4 **MECHANICALLY FASTENED INSULATION (METAL DECK)**

A. Specified insulation shall be mechanically fastened to conform to the ASCE 7 criteria for wind uplift as dictated by wind zone applicable to location of project. Fasteners and fastening patterns shall be determined by building height, location and geographical area of the United States. It is the contractor’s responsibility to consult current publications, literature, and bulletins of IBC and the manufacturer that are in effect at the time of this project. Boards shall be staggered and butted as close as possible with voids over one-fourth inch (1/4") to be filled.

B. Insulation shall be laid with edges parallel to flutes and bearing on deck surface/flats. The long dimension of base insulation layer must be fully supported by the top flange of the metal deck. The edges of insulation boards must not cantilever over the flutes of the metal deck.
C. The top surface of the first layer of insulation shall be coated with hot asphalt using twenty-five pounds (25#) per one hundred (100) square feet of surface, and a second layer of insulation shall be applied using offset joints, so that each layer breaks joints to a minimum of six inches (6") both ways with the preceding layer, and immediately walked in place.

3.5 FULLY ADHERED INSULATION (CONCRETE DECK)

A. Specified insulation shall be bonded to the venting base sheet with a solid mopping of steep asphalt Type IV, as required by slope (NRCA), at the minimum rate of thirty pounds (30#) ± 20% per one hundred (100) square feet and immediately walked in place.

B. The top surface of the first layer of insulation shall be coated with hot asphalt using twenty five pounds (25#) per one hundred (100) square feet of surface, and a second layer of insulation shall be applied using offset joints, so that each layer breaks joints to a minimum of six inches (6") both ways with the preceding layer, and immediately walked in place.

C. The top surface of the first layer of insulation shall be coated with hot asphalt using twenty five pounds (25#) per one hundred (100) square feet of surface, and a one-fourth inch (1/4") tapered layer of insulation shall be applied using offset joints, so that each layer breaks joints to a minimum of six inches (6") both ways with the preceding layer, and immediately walked in place.

3.6 ADJUSTING

A. Remove insulation which has been damaged (broken, cracked, punctured, wet, etc.) and install acceptable new units before installation of roof system.

3.7 CLEANING

A. Remove debris and material wrappers from jobsite. Leave insulation clean and dry, ready to receive roofing membrane.

3.8 PROTECTION

A. Provide special protection from traffic on completed work.

END OF SECTION 07 22 16
SECTION 074123 - METAL WALL AND SOFFIT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Metal wall panels with concealed fasteners.
2. Metal soffit panels with concealed fasteners.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for structural-steel framing.
2. Division 5 Section "Cold-Formed Metal Framing" for metal studs, bracing, anchorage, and framing accessories for metal wall and soffit panels, trim, and accessories.
3. Division 6 Section "Rough Carpentry" for wood framing.
4. Division 7 Section "Manufactured Roof Panels" for preformed metal roof panels.
5. Division 7 Section "Sheet Metal Flashing, Trim and Accessories" for metal flashing and trim not part of this Work.
6. Division 7 Section "Joint Sealants" for field-applied sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide manufactured wall panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

B. Air Infiltration: Provide manufactured wall panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. (0.45 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 4.0 lbf/sq. ft. (192 Pa).

C. Water Penetration: Provide manufactured wall panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb/sq. ft. (300 Pa) and not more than 12.0 lb/sq. ft. (575 Pa).

D. Structural Performance: Provide manufactured wall panel assemblies capable of withstanding design wind loads indicated under in-service conditions with deflection no greater than the following, based on testing manufacturer's standard units according to ASTM E 330 by a qualified independent testing and inspecting agency.


1.4 SUBMITTALS

A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

B. Shop Drawings: Show layouts of panels, details of corner conditions, joints, panel profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work. In order for the panel manufacturer to agree to warrant the final panel installation, comply with the panel manufacturer's submittal requirements. Verify the requirements, if any, with the panel manufacturer.
prior to commencing shop drawing creation. The panel manufacturer requirements may include, but are not limited to, the following:

1. Shop drawings required to be drawn by the panel manufacturer.
2. Shop drawings required to be reviewed by the panel manufacturer prior to, or after, review by the Architect.
3. Shop drawings review stamps from the manufacturer or from some manufacturer specified outside party – follow the required sequence of stamp collection required by the panel manufacturer.
4. Shop drawings with prerequisite requirements unique to the manufacturer of the panels – coordinate requirements prior to signing contracts with panel manufacturer.

C. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples for Verification: Provide sample panels 12 inches (300 mm) long by actual panel width, in the profile, style, color, and texture indicated. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: Indicate compliance of manufactured wall panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed metal wall panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 699.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated wall panel assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: As indicated by design designations in UL’s "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section “Project Meetings".

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.

B. Handling: Exercise care in unloading, storing, and erecting wall panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.
1.7 PROJECT CONDITIONS

A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish opening dimensions and proceed with fabricating wall panels without field measurements or allow for trimming panel units. Coordinate wall construction to ensure actual locations of structural members and to ensure opening dimensions correspond to established dimensions.

1.8 WARRANTY

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

B. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal wall panels within the specified warranty period and agreeing to repair finish or replace wall panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.

C. Finish Warranty Period: 20 years from date of Substantial Completion.

D. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal wall panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Weathertight Warranty Period: 20 years from date of Substantial Completion.

PART 2 – PRODUCTS

A. Design Basis:
   a. Metal Wall Panel One (MP1):
      BERRIDGE HR-16 WALL PANEL (24 Gauge)
      1. Panel coverage width shall be 16”, with a panel depth of 7/8”.
      2. Ribs to be spaced 4” on center.
      3. Panels shall be of interlocking design with integrated fastening flange for concealed fasteners.

2.1 MANUFACTURERS

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

1. Wall and Soffit Panels:
   24 guage base sheet metal: These manufacturer’s products may be bid on the project, subject to the products matching or exceeding the material properties of the specified design basis. The color of the product shall match the design basis – provide custom colors if necessary.

   AEP-Span. (www.aep-span.com ) (800-527-2503)
   Alcoa Architectural Products (www.alcoacladdingsystems.com ) (770-449-5555)
   ATAS International, INC. (www.atas.com ) (800-468-1441)
   Centria (www.centria.com ) (412-299-8000)
   Metal Building Components, Inc. (www.mbci.com )
   Armstrong (www.armstrong.com)
   Firestone Metal Products (www.firestonemetal.com ) (800-426-7737)
   Centria (www.centriaperformance.com ) (800-759-7474)
   Hunter Douglas (www.hunterdouglascontract.com ) (281-655-8433)
2.2 WALL AND SOFFIT PANEL ASSEMBLIES

A. Exterior Wall and Soffit Panels: Fabricate panel face sheets to the profile or configuration indicated; and of the material, finish, and thickness indicated. Design joints between panels to form weathertight seals.

1. Steel Face Sheet: 24 gauge thick, metallic-coated steel sheet with organic coating finish, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Use stainless-steel fasteners for exterior applications and galvanized steel fasteners for interior applications.
2. Provide exposed fasteners with heads matching color of panel by means of plastic caps or factory-applied coating.
3. Provide metal-backed neoprene washers under heads of exposed fasteners located on weather side of panels.

B. Accessories: Unless otherwise specified, provide components required for a complete wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, seam covers, flashings, sealants, gaskets, closure strips, and similar items. Match materials and finishes of panels.

1. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked, polyolefin-foam flexible closure strips. Cut or premold to match configuration of panels. Provide closure strips where indicated or necessary to ensure weathertight construction.
2. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
3. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant as recommended by panel manufacturer.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat, unless otherwise indicated. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

D. Closure (Metal Soffit): Flat Recessed Closure: 5/8 inch wide roll-formed aluminum hat-shaped closure panel to snap-fit between ceiling panels; black finish.

E. METAL SUSPENSION SYSTEMS, GENERAL (Metal Soffit):

2. Hanger Wire: 12 gage galvanized carbon steel hanger wire.

2.4 FABRICATION

A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Sound Control: Where sound-absorption requirement is indicated, fabricate interior liner panels with 1/8-inch- (3-mm-) diameter holes uniformly spaced approximately 1000 holes per square foot (10 750 holes per square meter). Cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid.
C. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials that are noncompatible or could result in corrosion or deterioration of either materials or finishes.

D. Fabricate panel joints with captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel walls.

1. Panel Supports and Anchorage: Examine wall and soffit framing to verify that girts, angles, and other secondary structural panel support members and anchorage have been installed to meet requirements of panel manufacturer.

2. Do not proceed with wall or soffit panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate metal wall panels with rain drainage work; flashing; trim; and construction of soffits, roofing, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

3.3 PANEL INSTALLATION

A. General: Comply with panel manufacturer’s written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting exterior panels by torch is not permitted.

2. Install panels with concealed fasteners.

3. Install panels with exposed exterior and interior fasteners, prefinished to match panel finishes.

4. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled, uniform compression for positive seal without rupture of neoprene washer.

B. Accessories: Install components required for a complete wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, seam covers, flashings, louvers, sealants, gaskets, fillers, closure strips, and similar items.

C. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of wall panel and soffit assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.

1. Install weatherseal to prevent air and moisture penetration. Flash and seal panels at ends and intersections with other materials with rubber, neoprene, or other closures to exclude weather.

2. Seal panel end laps with a bead of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.

3. Prepare joints and apply sealants to comply with requirements of Division 7 Section “Joint Sealants.”

D. Wall Panels: Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as necessary for waterproofing. Handle and apply sealant and back-up according to sealant manufacturer’s written instructions.

1. Align bottom of wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
2. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
3. Provide weatherproof escutheons for pipe and conduit penetrating exterior walls.
4. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating.

E. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.4 CLEANING AND PROTECTING

A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION 074123
PART 1 - GENERAL

1.1 SUMMARY

A. Preparing substrate to receive roofing.
B. Application of roof membrane and accessories.
C. Application of reflective roof surface coating.

1.2 RELATED SECTIONS

A. Section 06110 – Rough Carpentry
B. Section 07220 – Roof Insulation
C. Section 07600 – Flashing and Sheet Metal: Weather protection for base flashing

1.3 REFERENCES

A. ASTM D 41 Asphalt Primer used in Roofing
B. ASTM D 312 Asphalt used in Roofing
C. ASTM D 2178 Asphalt Glass Felt used in Roofing
D. ASTM D 4586 Asphalt Roof Cement – Asbestos Free
E. ASTM D 6163-97 SBS Modified Bituminous Sheet using Glass Fiber Reinforcement
F. ASTM D 6164 SBS Modified Bituminous Sheet using Polyester Fiber Reinforcement
G. ASTM D 5147 Thickness Measurements of Modified Bituminous Ply Materials. Note that any measurements taken for ply products shall be at the selvage edge only, and not include the granules, even though this standard allows for granules to be included.
I. ASCE-7 "Minimum Design Loads for Buildings and Other Structures": Roof Assembly Classification for Wind Uplift.
J. FM, 1-SH Roof Assembly Classification for Severe Hail Exposure.
K. NRCA Roofing and Waterproofing Manual
L. UL Fire Hazard Classifications
M. FM Approval Standards 4450 and 4470.

1.4 SYSTEM DESCRIPTION

A. Typical: Four-ply, Modified Bitumen Roofing System. Granular surfaced fiber reinforced modified bitumen cap sheet applied in mopping of hot asphalt over 3 plies of felt inner ply sheets applied in mopping of hot asphalt over coverboard set in hot asphalt to rigid insulation mechanically fastened to roof deck.

1.5 PERFORMANCE REQUIREMENTS

A. Roofing System: Shall prevent water migration into roof assembly, or building interior through the roof membrane and/or membrane base flashing.
1.6 SUBMITTALS

A. Submit under provisions of application Section.

B. Shop Drawings: Provide layout of tapered insulation crickets and saddles.

C. Product Data: Submit membrane and bitumen material data (including equiviscous temperature), base flashing materials, insulation, traffic pads, mechanical fasteners, base sheet fasteners and all proposed materials and accessories.

D. Samples: Submit two sample one pound containers of roofing aggregate.

E. Test Reports: Provide delivery tickets for each batch of bitumen, stating type, flash point (FP), equiviscous temperature (EVT), and finished blowing temperature (FBT).

F. Product Data: Indicate membrane products, base flashing materials, mechanical fasteners and all other proposed materials and accessories as required for materials in this Work.

G. Submit roof membrane manufacturer’s recommendations for spacing of roofing system fasteners to resist wind uplift pressures specified in Article 1.10.
   1. Submit wind uplift resistance calculations to back up fastener spacing recommendations.
   2. Submit evidence that roofing system fastener pattern is in compliance with provisions of FM 4450 and FM 4470.

H. Manufacturer’s Installation Instructions: Include installation sequence, special instructions and Material Safety Data Sheets (MSDS).

I. Manufacturer’s Certificate: Letter on material manufacturer’s letterhead certifying that a technical representative has reviewed these specifications, and that the products proposed for use meet or exceed specified requirements, and that products proposed are compatible with one another, with the known substrate, and with the proposed insulation material; and that the system will be capable of receiving specified warranty.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacture of the products specified, with five (5) years documented experience in the uninterrupted, and unmodified manufacture of the roofing system and component elements of the roofing system specified herein.

B. Applicator: Company specializing in the work of this Section, having a minimum of five (5) years documented experience applying modified bitumen roofing systems, and approved by the Manufacturer for not less than three (3) years to install the specified roof system so as to achieve a twenty (20) year no dollar limit warranty.

1.8 REGULATORY REQUIREMENTS

A. Conform to all applicable local codes for roof assembly fire hazard requirements.

B. Provide certification of inspection confirming approval of design and installation by authority having jurisdiction.

C. Fire Hazard Classifications: UL Class A.

1.09 PRE-INSTALLATION CONFERENCE

A. Convene a preinstallation conference two weeks prior to commencing the Work.

B. Require attendance of parties directly affecting the Work of this Section.

C. Review condition of roof deck and installation, installation procedures and coordination with related work.
1.10 **DEVELOYMENT, STORAGE AND HANDLING**

A. Deliver products to the site and store/protect on-site under provisions of applicable provisions of Division 1.

B. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact. Include test report data required by this specification.

C. Store products in weather protected environment clear of ground and moisture.

D. Stand and store roll goods on end.

E. Do not store more materials on the roof than can be installed that day.

1.11 **SITE CONDITIONS**

A. Job Condition Requirements:

1. Coordinate the work of the contractor with the work to be performed by the Owner's personnel, to ensure proper sequencing of the entire work. The Owner's personnel will be erecting interior protection for equipment, if required. The contractor is to schedule his work so that adequate time is allowed for the Owner's personnel to perform this work. No roof work shall be performed until the Owner's personnel have completed erection of the interior protection in that area.

2. Apply roofing in dry weather.

3. Do not apply roofing when ambient temperature is below 40° F (4° C).

4. Proceed with roofing work only when weather conditions are in compliance with manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with specifications.

5. For further information regarding roofing material manufacturer's recommendations for project conditions, refer to the manufacturer's published application manual.

6. Schedule the work so the building will be left watertight at the end of each day. Do not remove more roofing or insulation material than can be reinstalled in any working day.

7. Phased application of roofing plies is not recommended. However, if conditions do not allow installation of the complete roof membrane and the area must be left exposed overnight, it is recommended that the incomplete membrane be visually inspected and sealed with hot bitumen before leaving the work area for the night. A glaze coat of hot asphalt should be applied in a relatively thin film. The surface should be dry and clean before installing additional plies.

8. All surfaces to receive new roofing shall be smooth, dry, and free from dirt, debris, and foreign material before any of this work is installed. Competent operators shall be in attendance at all times equipment is in use. Materials shall be stored neatly in areas designated by the Owner. Load placed on the roof at any point shall not exceed the safe load for which the roof is designed.

9. The contractor shall take all necessary precautions to protect the roof mat and deck from damage. The contractor shall be responsible for repairing all new areas of damage caused by the negligence of the contractor, at the contractor's expense. The Owner's on-site representative shall determine damage caused by contractor negligence.

10. The contractor is to be aware of the potential for roof leaks on the existing roof as a result of ruptured blisters and/or roof mat damage caused by the vacuum process, foot traffic, or material and equipment storage. The contractor is to take all necessary precautions to prevent damage to the existing roof. All damage to the existing roof that could result in roof leaks is to be repaired on a daily basis by the roofing contractor.

11. The contractor shall follow local, state, and federal regulations, safety standards, and codes for the removal, handling, and disposal of asbestos containing materials, if present. When a conflict exists, use the stricter document.

12. Follow insurance underwriter's requirements acceptable for use with specified products or systems.
13. Due caution should be exercised so as not to alter the structural integrity of the deck. When cutting through any deck, care should be taken so as not to damage the deck or any part of the deck, such as post tension cables, etc.

14. All kettles shall have an automatic thermostat control, and temperature gauge, all in working order.

15. A temperature recording device, twenty-four (24) hour type, shall also be used. Daily records will be delivered to the Owner's representative or designated person, at the end of each twenty-four (24) hour recording. Calibrate all temperature controls.

16. The contractor is to verify the location of all interior ducts, electrical lines, piping, conduit, and/or similar obstructions. The contractor is to perform all work in such a manner as to avoid contact with the above mentioned items.

17. Surface and air temperatures should be a minimum 45° F during applications of cleaner and waterproof coating and remain above 45° F for a minimum of four (4) hours following applications. Verify compatibility of cleaner with coatings, paints, primers and joint sealers specified. Advise Owner's representative of any problems in this regard prior to commencing cleaning operations.

18. Temporary Sanitary Facilities: The contractor shall furnish and maintain temporary sanitary facilities for employees' use during this project. These will be removed after the completion of the project. All portable facilities shall comply with local laws, codes, and regulations.

B. Protection of Work and Property:

1. Work: The contractor shall maintain adequate protection of all his work from damage and shall protect the Owner's and adjacent property from injury or loss arising from this contract. He shall provide and maintain at all times any OSHA required danger signs, guards, and/or obstructions necessary to protect the public and his workmen from any dangers inherent with or created by the work in progress. All federal, state, and city rules and requirements pertaining to safety and all EPA standards, OSHA standards, NESHAP regulations pertaining to asbestos as required shall be fulfilled by the contractor as part of his proposal.

2. Property: Protect existing planting and landscaping as necessary or required to provide and maintain clearance and access to the work of this contract. Examples of two categories or degrees of protection are generally as follows: a) removal, protection, preservation, or replacement and replanting of plant materials; b) protection of plant materials in place, and replacement of any damage resulting from the contractor's operations.

3. Twenty-four Hour Call: The contractor shall have personnel on call 24 hours per day, seven (7) days per week for emergencies during the course of a job. The Owner's Project Manager is to have the 24 hour numbers for the contact. Contractor must be able to respond to any emergency call and have personnel on-site within two (2) hours after contact. Numbers available to the Owner's Project Manager are to be both home and office numbers for:

   a. Job Foreman
   b. Job Superintendent
   c. Owner or Company Officer

C. Damage to Work of Others: The contractor shall repair, refinish, and make good any damage to the building or landscaping resulting from any of his operation. This shall include, but is not limited to, any damage to plaster, tile work, wall covering, paint, ceilings, floors, or any other finished work. Damage done to the building, equipment, or grounds must be repaired at the successful contractor's expense holding the Owner harmless from any other claims for property damage and/or personal injury.

D. Measurements: It will be the contractor's responsibility to obtain and/or verify any necessary dimensions by visiting the job site, and the contractor shall be responsible for the correctness of same. Any drawings supplied are for reference only.
E. Cleaning and Disposal of Materials:

1. Contractor shall keep the job clean and free from all loose materials and foreign matter. Contractor shall take necessary precautions to keep outside walls clean and shall allow no roofing materials to remain on the outside walls.

2. All waste materials, rubbish, etc., shall be removed from the Owner's premises as accumulated. Rubbish shall be carefully handled to reduce the spread of dust. A suitable scrap chute or hoist must be used to lower any debris. At completion, all work areas shall be left broom clean and all contractor's equipment and materials removed from the site.

3. All bituminous or roofing related materials shall be removed from ladders, stairs, railings, and similar parts of the building.

4. Debris shall be deposited at an approved disposal site.

1.12 QUALITY ASSURANCE

A. Work of this Section shall conform to the NRCA Roofing and Waterproofing Manual, latest edition, manufacturer's installation instructions and these Construction Documents. Maintain one copy of each document on site during operations.

B. Keep a daily log with the minimum following information:

1. Nature of operation and quantity of Work, and materials and areas installed.

2. Personnel on site, by job function and task. Also keep a list of all site visitors.

3. Material deliveries identifying quantity and type.

4. Daily weather conditions, including percentages of rain forecast, wind conditions and daily temperatures.

C. Do not allow materials which have not been approved through the submittal process to be brought onto the project site. Any materials brought onto the site which have not been approved through the submittal process will be rejected and shall be removed immediately. Remove - without appeal or exception - any materials incorporated into the Work, which have not been approved through the submittal process.

D. The manufacturer's representative shall make a minimum of two (2) site visits to the project per month at critical stages of the roof installation, and forward to the Architect written reports of the observations and instructions given to the Contractor during these visits. Coordinate the visits to take place at the time of the Architect's visits, with one occurring at the monthly pay application meeting. The reports shall include at the minimum the following information:

1. Reports shall be typewritten on the manufacturer's letterhead stationery, and be provided to the Architect within seven (7) days of the site visit.

2. Reports shall document the Work in progress and list all deficiencies and corrective actions and recommendations.

3. **NOTE:** Failure of the manufacturer's representative to provide the required reports is cause for rejection of the Contractor's pay application.

1.13 ENVIRONMENT REQUIREMENTS

A. Do not apply roofing during inclement weather.

B. Do not apply roofing membrane to damp or frozen deck or substrate.

1.14 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of applicable Division 1 Specifications.

B. Coordinate and schedule roof installation so that sufficient materials and manpower are available to completely replace and make watertight, all roofing installed each day.
C. Coordinate installation of associated metal counterflashings and roof accessory items as work of this Section progresses.

D. Schedule work to avoid storage on, and traffic over finished roofing membrane.

E. Schedule installation of cap sheet membrane so as to minimize joints. Install over as large an area as practical, and within natural breaks in the roof areas.

1.15 MECHANICAL SUPPORTS

A. Shall be polyester/vinyl supports, with channels to accommodate one-half inch or one inch (1/2” or 1”) diameter pipe, adjustable from three and one-eighth inches to four and one-eighth inches high (3-1/8” to 4-1/8”) to accommodate risers, having a four inch (4”) base; KnuckleHeads, as manufactured by Chem Link, or approved equal.

1.16 WARRANTY

A. Provide two (2) year contractor's warranty under provisions of applicable Section, covering labor and material to replace damaged or defective material, and/or material which fails to resist the penetration of water within twenty-four (24) months of application.

B. Provide twenty (20) year Manufacturer's No-Dollar-Limit (NDL) Full System warranty on the above-deck roofing system. Warranty to cover costs of material and labor to replace roofing material which fails to resist the penetration of water due to failure of either material or workmanship, with no penal sum.

1. Manufacturer’s warranty shall cover above deck roofing components against wind uplift resulting from wind speeds up to 90 miles per hour.

PART 2 - PRODUCTS

2.1 MANUFACTURES – SHEET AND BITUMINOUS MATERIALS

A. Soprema

C. GAF

D. Siplast

E. Or Prior approved equal

2.2 SHEET MATERIALS

A. System Components:

1. Shall be venting base sheet, Type G 2, with 5/8” perforations on three inch (3”) centers meeting ASTM D 4897 Type II and ASTM D 3672 Type II, listed in Factory Mutual Approval Guide, 1. Felt Interplies:

2. Shall be Underwriters Laboratory approved and listed in the FM Global Approval Guide.

3. Shall be three (3) Type VI fiberglass ply sheet, Underwriters Laboratory Type G-1, meeting Federal Specification No. SS-R-620B, ASTM D 2178, Type III, or approved equal.

4. Cap Ply:

a. Membrane Top Ply: High Reflectivity White Surface Cap Sheet:

1) Description: Roofing membrane shall have a fiberglass mat reinforcement and thermod fusible elastomeric asphalt. Top surface to have White High-Reflective Film surface. Application is for hot asphalt.

b. Physical Properties:

1) Approximate Weight: 86 lbs/sq
2) Approximate thickness: 138 mils
3) Total System thickness: 228 mils
   c. White reflective surface certifications: Shall be listed by Energy Star and CRRC:
      1) Initial Solar Reflectance Value: .78
      2) Weathered Reflectance Value: .74
      3) Initial Emissivity Value : .89
      4) Weathered Emissivity Value: .66

B. Base Flashing: Polyester reinforced modified bitumen flashing sheet.
   1. Description: Flashing membrane shall have a non-woven polyester reinforcement and thermofusible elastomeric asphalt. Both sides shall have a high-brush sanded surface. This membrane is to be applied by hot mopping only.
   2. Physical Properties:
      a) Approximate roll weight: 92 lbs.
      b) Approximately thickness: 90 mils

C. Flexible Flashing: Ply Flashing: Fiberglass or polyester mat coated with modified bitumen and white granules. The flashing system is to be approved by the membrane manufacturer for use with its respective system.

2.3 WHITE SELF-ADHERING WELDED-SEAM VERTICAL FLASHING MEMBRANE
A. Membrane shall be nominal TPO fleece-backed sixty (60) mil in overall thickness consisting of a white thirty-five (35) mil EIP elastomeric membrane with twenty-five (25) mil thick backing of styrene butadiene styrene (SBS) adhesive with a minimum one and one-half inch (1-1/2") dry selavage edge for welding. The white self-adhering welded-seam membrane shall be a high-performance elastomeric membrane incorporating polyester reinforcement fibers.

2.4 BITUMINOUS MATERIALS
A. Asphalt: ASTM D312, Type IV
B. Asphalt Primer: ASTM D41
C. Plastic Roofing Cement: MBR type, formulated for use with SBS modified bitumen membrane products

2.5 ACCESSORIES
A. Walkway Pads: White-Walk Meadows, or approved substitute
B. Mechanical Fasteners for Flexible Flashing:
   1. Concrete: Drive Pin having corrosion resistant mandrel with stainless steel pin, factory equipped with metal clad EPDM washer, Rawl Zamac
   2. Concrete Masonry: Hot-dip galvanized, threaded fastener with integral rubber sealing washer, Tap-Con by Rawl.
   4. Wood: Galvanized steel, annular ring roofing nails with integral one inch (1") cap, roofing nail by Simplex.
C. Termination Bar: One-eighth inch by one inch (1/8" x 1") nominal, hot dipped galvanized steel bar stock, with one-fourth inch (1/4") diameter prepunched slotted holes at four inches to six inches (4" – 6") on center.

2.6 ROOF HATCH
A. Shall be premanufactured hatch with required OSHA safety equipment, as manufactured by Bilco Company, or approved equal. Size shall be thirty-six inches by thirty-six inches (36" x 36") opening with full height ladder and OSHA approved support bar extension.
1. Material: Aluminum with 11-gauge cover and frame.

2. Cover: Breakformed, hollow-metal design with three inch (3") concealed fiberglass insulation, three inch (3") beaded, overlapping flange, fully welded at corners, and internally reinforced for 40 psf live load.

3. Curb: Twelve inches (12") in height with integral cap flashing. One inch (1") fiberboard insulation, fully welded at corners, and three and one-half inches (3-1/2") mounting flange with seven-sixteenths inch (7/16") holes provided for securing frame to the roof deck.

4. Gasket: Extruded EPDM rubber gasketed permanently adhered to cover.

5. Hinges: Heavy-duty pintle hinges with three-eighths inch (3/8") Type 316 stainless steel hinge pins.


7. Lift Assistance: Compression spring operators enclosed in telescopic tubes with automatic hold-open arm with grip handle release.


9. Hardware: Aluminum with engineered compression spring tubes. Steel compression springs with electrocoated acrylic finish and Type 316 stainless steel hinges. All other hardware is zinc plated/chromate sealed.

10. Roof hatch must have a minimum R-value of 12.

B. Contractor shall provide a sixteen inch by sixteen inch (16” x 16”) metal plaque on the underside of each of the roof hatches that states the following:

   1. Architect name, phone number, contact person,
   2. School district phone number, contact person,
   3. School district emergency phone number,
   4. Contractor name, phone number, contact person,
   5. Subcontractor name, phone number, contact person,
   6. Roof Consultant, name, phone number, contact person,
   7. Roof system, warranty information, and
   8. Roof Manufacturer, phone number, contact person.

2.7 SOURCE QUALITY CONTROL AND TESTS

   A. Require roofing material manufacturer to provide source, batch and test data on each shipment of roofing products.

   B. Provide equiviscous temperature (EVT) data for all asphalt:

      1. Individual Containers: EVT data shall be legibly imprinted on the label.
      2. Bulk Shipments: Provide duplicate of delivery ticket indicating EVT.

   C. Deliver asphalt to job site, or provide certified samples of the asphalt, if stored off-site, two weeks prior to commencement of the Work. Owner may perform independent testing to confirm compliance.
PART 3 – EXECUTION

3.1 SUBSTRATE PREPARATION

A. Tear off: Remove all built up roofing, flashing, insulation, and sheet metal down to the roof deck or original substrate. Substrate shall be smooth, free of debris, sharp edges, and other surface irregularities prior to starting roofing application. Substrate repair shall be performed as required to minimum of NRCA standards.

B. New Construction: Substrate shall be smooth and free of debris, sharp edges, and other surface irregularities prior to work starting. Substrate repair shall be performed as required to minimum of NRCA standards.

C. Prepare other surfaces according to respective manufacturer's or applicator's published instructions.

D. Use cleaning materials necessary to render an acceptable surface.

E. Use compatible materials on voids and joints so finished deck surface will be even and smooth.

F. Protect adjacent areas with tarpaulin or other durable materials.

G. Damaged decking shall be replaced with like materials as authorized on unit cost basis using procedures as recommended by the manufacturer.

H. Contractor shall be responsible for sealing, as required, all openings that may allow bitumen migration or dripping, i.e. pitch dams, envelopes, filler strips, etc.

I. Concrete Decks:
   1. Surface irregularities shall be corrected with quick setting mortar mix.
   2. Joints should be filled with quick setting mortar mix to provide a level surface.
   3. Concrete must be primed and allowed to dry before applying any asphalt.
   4. The following shall be used and passed as an acceptable means of testing the dryness of a concrete roof deck:
      a) Use approximately one (1) pint of bitumen that is specified for use in the roof membrane, heated to a temperature that will ensure an application temperature of 400° F.
      b) Pour the bitumen on the surface of the deck. If the bitumen foams, the deck is NOT dry enough to roof.
      c) After the bitumen has cooled, an attempt should be made to strip the bitumen from the deck surface. If the bitumen strips clean from the deck, the deck is NOT dry enough to roof.

5. Prestressed, precast concrete slabs require the following preparation:
   a) If there is a screeded fill over the slabs, the joints of the slabs should be left open.
   b) If screeded fill is not used to cover the slabs, the joints of the slabs shall be sealed with an elastomeric sealant.
   c) After priming, six inch (6") wide .072 inch self adhered coal tar elastomeric membrane strips shall be applied over each joint in the deck before laying the venting base sheet.
   d) Before applying the membrane strips to the joints, a leveling fill of quick setting mortar must be used whenever slab edges are out of plane by more than one-half inch (1/2").

3.2 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive the Work of this Section.

B. Verify that deck is secure, that it is clean and smooth, free of depressions, waves, abrupt elevation change, protrusions, or projections and properly sloped to drains.

C. Verify that deck surfaces are dry and free of frost, dew or other moisture.

D. Verify that roof openings, curbs, sleeves and vents through the roof are solidly set and ready to receive this Work.

3.3 PREPARATION

A. Protect all building surfaces against damage from roofing work.
B. Prevent debris and bitumen from entering the building, any drains, downspouts, plenum spaces and/or roof openings.

C. Clean surfaces of roof deck and maintain free of dirt, debris and any deleterious material during roofing operations.

3.4 GENERAL MEMBRANE APPLICATION

A. Application shall conform to these specifications and the roofing material manufacturer's written instructions. If discrepancies occur, the more stringent requirement is to be applied.

B. Application of roofing shall immediately follow the application of any insulation as a continuous operation. Under no circumstance is insulation to be left exposed at the end of the day. Insulation left exposed overnight will be removed and replaced at no cost to the Owner.

C. Masonry and metal surfaces to receive roofing shall be primed with a uniform coating of approved asphalt primer.

D. Unless otherwise noted, all layers of roofing shall be installed perpendicular to the slope of the deck; completely free of wrinkles, creases or fishmouths. Membrane application by the "mop and flop" technique will not be permitted.

E. Asphalt kettles or tankers employed under this Contract shall be equipped with functioning, accurately calibrated, readable thermometers.

F. Asphalt shall be applied in uniform mopping free of voids or holidays, at a rate of approximately 23 pounds per 100 square feet, and at a temperature of not less than 400° F, nor more than 25° F above the asphalt's listed Equiviscous temperature (EVT).

3.5 APPLICATION OF PLY SHEETS

A. Cover Board shall be covered with one (3) layers of fiberglass ply sheet Type VI fully adhered as follows:

   Each layer shall be solid mopped at the nominal rate of thirty pounds (30#) ± 20% per one hundred (100) square feet using steep asphalt Type IV as required by slope, properly heated. Specified layers shall be applied in accordance with the manufacturer's recommendations and in accordance with general practices as set forth by the NRCA Roofing Manual.

B. Use starter sheets at all edges as required.

3.6 CAP PLY APPLICATION

A. Beginning at low point of roof, apply approved cap sheet in mopping of hot asphalt. Provide four inch (4") side laps and six inch (6") end laps. Stagger end laps thirty-six inches (36") from adjacent rows.

B. All layers of roofing shall be installed free of wrinkles, creases and fishmouths.

C. Prohibit foot and cart traffic from newly applied felts. Do not "walk-in" plies.

3.7 FLASHING APPLICATION

A. Flashing shall be placed at all vertical junctures with the roof, and at all penetrations. It will consist of the approved Base Flashing sheet applied over one or more reinforcing ply sheets.

B. Reinforcing ply sheet will be placed in a mopping of hot asphalt providing three inch (3") side laps. Secure top edge with approved fasteners at six inches (6") on center. Sheet to extend four inches (4") beyond the toe of the cant onto the horizontal surface of the membrane; and extend not less than three inches (3") above the top of the cant onto the vertical wall/curb surface.

C. Flashing plies shall be cut from the end of the roll and applied vertically always working to a selvage edge.

D. The exposed flashing membrane will be mopped into place providing three inches (3") side laps. Top edge to be secured with approved fasteners at six inches (6") on center. Side laps are not to coincide with side laps of reinforcing ply sheet.
E. Prime surface of flashing membrane sheet to receive flashing.

F. Extend flashing sheet four inches (4") beyond toe of cant onto horizontal field of the roof, and extend onto vertical face of wall/curb not less than eight inches (8") above finished roof surface. Secure top edge with approved fasteners at six inches (6") on center.

   1. At concrete or masonry surfaces, secure top edge of flashing utilizing a continuous metal termination bar.

3.8 SELF-ADHERING WELDED-SEAM VERTICAL WALL FLASHING (FOR USE APPROXIMATELY 8" ABOVE THE FINISHED ROOF LINE AND EXTENDING UPWARD)

A. White self-adhered welded seam membrane flashing shall be installed on the vertical beginning approximately eight inches (8") above the finished roof line (where the membrane is terminated), with length of run not to exceed the width of the material roll. Strapped flashing method shall be installed in strict accordance with the manufacturer's recommendations.

B. The termination bar used to terminate the eight inch (8") high base flashing shall be used to terminate the lower edge of the vertical flashing. This will cause the termination bar to be buried at the eight inch (8") minimum height. Care should be taken to ensure the top edge of the base flashing and bottom edge of the vertical flashing are both secured.

C. All substrates receiving welded-seam flashing membrane shall be clean and primed with asphalt primer, prior to application.

D. All vertical flashing lap seams of the self-adhered welded seam membrane shall be hot-air welded. NOTE: Once the membrane has been contaminated with hot asphalt, it is not possible to clean the asphalt off and hot air weld it for a long term effectiveness. A patch of membrane must be welded over the area large enough to be welded one and one-half inches (1-1/2") past any contaminated area.

E. Flashing laps shall be minimum three inch (3") width, no maximum. Hot-air weld of flashing lap shall be minimum one and one-half inch (1-1/2") width, no maximum.

F. Immediately following the laying of the self-adhered welded seam membrane, it shall be pressed or rolled in the width direction of the membrane. This will prevent excessive entrapment of air beneath the membrane. The pressing or rolling shall be in the width direction and with the laps so as not to buck the laps.

G. Any flashing extending further than eight inches (8") up onto a vertical surface shall be installed using the strapped method and must be fastened with a termination bar or installed up and over the parapet wall and fastened to the nailer on the outside of the wall.

H. The self-adhered welded seam flashing membrane shall be run up the wall in three foot (3') widths, run under the coping cap and be terminated on the outside of the wall six inches (6") on center; then the coping cap shall be reset. All side laps are to be hot-air welded.

3.9 ROOF HATCH

A. Install hatch per manufacturer's guidelines.

B. Install specified metal plaque on the underside of each hatch lid.

C. Provide required structural members to properly install the roof hatch.

3.10 MECHANICAL SUPPORTS

A. The four inch (4") base of the KnuckleHead polyester/vinyl supports shall be bonded to an additional layer of membrane installed over the roof. Both the additional layer of membrane, and the support, shall be installed using M-1 Structural Adhesive/Sealant.

3.11 FIELD QUALITY CONTROL

A. Owner reserves the right to have finished Work inspected using infrared thermography or other appropriate, non-destructive means to establish satisfactory conditions of completed Work.
B. Correct identified defects or irregularities. Cut out and repair membrane defects before end of each day.

3.12 MANUFACTURER'S FIELD SERVICES

A. Provide manufacturer's field services as required to qualify for specified warranty.

B. Roofing materials manufacturer's representative shall visit the site and observe the progress of the Work at a rate of not less than twice per month (every other week).
   1. Site visits shall be followed up by a written report of findings which is to be transmitted to the Owner's Representative within two (2) weeks of the site visit.

3.13 CLEANING

A. Remove bituminous markings from finished surfaces.

B. In areas where finished surfaces are marred, or soiled by Work of this Section, consult manufacturer of soiled surface for cleaning advice and conform to their written instructions.

C. Repair or replace defaced or disfigured finishes caused by Work of this Section.

3.14 PROTECTION OF FINISHED WORK

A. Protect finished Work under provision of application Section.

B. Where traffic must continue over finished roof installation, protect surfaces with minimum one-half inch (1/2") wood fiberboard insulation, under five-eighth inch (5/8") thick plywood protective walkways ballasted in place with sandbags or the like.

END OF SECTION 07 52 16
SECTION 07 62 00 - SHEET METAL AND MISCELLANEOUS ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Provide flashing and sheet metal components for moisture protection.
   2. Related accessories.

1.2 SUBMITTALS

A. Product Data: Submit shop drawings, product data and mockups of all sheet metal. In the event that the Contractor intends to comply - without deviation - with the Drawings, shop drawings will not required as part of this Section.
   1. Should any changes from the Contract Document drawings be anticipated - submit detailed and accurate-to-scale, professionally-prepared shop drawings, showing the changes and including all components.
   2. Include the date, project name and Drawing Detail number of the detail proposed for change.
   3. Include with initial submittals a letter confirming Contractor's intent to comply with these provisions.

B. Provide product data containing data that confirm all materials proposed for use in the system meet the standards indicated in this Section.

C. Mark each proposed item in product data by circling or highlighting, and affixing the corresponding Article and Paragraph numbers from this Specification. Product data not so marked will be returned without review, for re-submittal.

D. Submit evidence that installer is qualified in the fabrication and installation of metal edge securement in accordance with ANSI/SPRI ES-1.

1.3 QUALITY ASSURANCE

A. Comply with governing local, state, and federal regulations, safety standards, and codes. Provide products of acceptable manufacturers in satisfactory use in similar service for five (5) years. Use experienced installers. Deliver, handle and store materials in accordance with manufacturer's instructions.


1.4 WARRANTIES

A. Manufacturer's Product Warranty: Submit manufacturer's standard limited product warranty signed by the manufacturer's authorized official, guaranteeing to correct failures in product which may occur during the warranty period, without reducing or otherwise limiting any other rights to correction which the Owner/Project Consultant may have under the contract documents. Failure is defined to include product failure which leads to interruption of a watertight installation. Correction may include repair or replacement of failed product.

B. Contractor's Warranty Period: For roofing flashing and sheet metal, provide a written warranty which shall warrant work to be free of leaks and defects in materials and workmanship for two (2) years, starting from date of substantial completion.

C. Defects of the sheet metal occurring during the warranty period shall be promptly corrected by the contractor, and defects of the roofing shall be promptly corrected by the manufacturer at no additional cost to the Owner. Upon notification from the Owner or the Owner's representative that evidence of a defect exists, the responsible party shall immediately inform the Owner's representative of the date on which corrective work will be scheduled, and shall notify the Owner's representative when the corrective work has been completed.
PART 2 - PRODUCTS

2.1 SHEET METAL MATERIAL

A. Hot-dipped Galvanized Steel for use as counterflashings (where not visible from the ground), pitch pans and expansion joints: Minimum 24-gauge, G-90, hot-dipped galvanized metal, commercial quality, ASTM A 525.

B. Hot-dipped Galvanized Steel for use as continuous clips: Minimum 22-gauge, G-90, hot-dipped galvanized metal, commercial quality, ASTM A 525.

C. Prefinished Galvanized Sheet Steel (where visible from the ground): Shall be 22-gauge flat stock, prefinished with Kynar finish meeting ASTM A 446, forty-five and one-half inches to forty-eight inches width by one hundred twenty inches in length (45-1/2” - 48” x 120”) for use as new metal edge gravel guard, cover plates, downspouts, gutters, coping and miscellaneous metal. Standard color to be selected by Owner/Project Consultant.

D. Stainless Steel: QQ-S-766, Class 301, 302, 304, or 316; or ASTM A 167, Type 301, 302, 304, or 316; form and condition most suitable for the purpose.

E. Aluminum and Aluminum Alloy Plate and Sheet: QQ-A-250; form, alloy, and temper shall be that most suitable for the purpose.

F. Sheet Lead: QQ-L-201, Grade B.

2.2 FASTENERS

A. Fasteners shall be same metal as flashing/sheet metal, or other non-corrosive metal as recommended by sheet manufacturer for the specific application. Match finish of exposed heads with material being fastened.

B. Fasteners and fastening plates or bars shall be listed in the FM Global Approval Guide.

C. Fastener for Brick: Shall be one-fourth inch by two inches (1/4” x 2”), zinc with plated steel or stainless steel nail, one piece unit, flat head.

D. Screws: Self-taping sheet metal type with neoprene washer, as appropriate.

E. Pop Rivets: Full stainless steel Series 42 or 44, as appropriate.

F. Continuous Clip: Concealed hold-down clip type; of same materials as coping, gravel guard, sized to suit application. Use a continuous clip, minimum 20-gauge G-90 galvanized.

2.3 RELATED MATERIAL

A. Bituminous Paint: Acid and alkali resistant, black color.


C. Solder: QQ-S-571 composition best suited for purpose; use high tin content, minimum 60/40, for stainless steel and monel alloy.

D. Sealant (for Sheet Metal): One-component polyurethane, conforming to requirements of FS TT-S-230C, non-staining and non-bleeding.

E. Miscellaneous Materials:
   1. Downspout Boots: Provide and install 16-gauge prefinished metal transition to storm drain, four feet (4’) in length above grade. Provide anti-siphon gap at transition, or pre-approved equal.
   2. Splash Blocks: Concrete, 3000 psi, 28 days. Provide and install with protection pads at all downspouts. Dimensions shall be a minimum eighteen inches wide by thirty-six inches long (18” x 36”).
   3. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size, and gauge required for performance.
5. Vent Flashings: All joints fully soldered. Provide with minimum 4-inch wide flange for stripping into new roof assembly. Attach flange to substrate wood blocking with stainless steel roofing nails spaced at 3 inches on centers, staggered.
6. Termination Bars: 12-gauge x 1inch hot-dipped galvanized bar stock fastened with specified drive pins spaced at 12 inches on center.
7. Equipment Curb Caps: All joints fully soldered. Attach to curbs per Drawings.

PART 3 - EXECUTION

3.1 INSPECTION
A. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set, cant strips and reglets in place, substrates are smooth and clean and nailing strips located.
B. Verify membrane termination and base flashings are in place, sealed and secure.
C. Beginning of installation means acceptance of conditions.

3.2 PREPARATION
A. Field measure site conditions prior to fabricating work. Provide all shop drawings and mock-ups one month prior to installation to the Owner/Project Consultant for approval.
B. Install starter and edge strips and cleats before starting installation.

3.3 FABRICATION - GENERAL
A. Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer's instructions and recommendations. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels as indicated, with exposed edges folded back to form hems.
B. Fabricate gravel stops/fascia, gutters/downspouts, counterflashings, pitch pans, expansion joints, and copings with new galvanized sheet metal as specified. Fabricate gravel guard and fascia to size and dimensions as indicated on the drawings. Fabricate metal coping, gutters and downspouts as indicated.
C. Form sheet metal on bending brake.
D. Shape, trim and hand seam metal on bench insofar as practicable.
E. Form materials with straight lines, sharp angles and smooth curves.
F. Fold back edges on concealed side of exposed edge to form hem (1/2" minimum).
G. Weld or solder joints on parts that are to be permanently and rigidly assembled.
H. Submit sheet metal models for approval by the Owner/Project Consultant.
I. Limit single-piece lengths to ten feet (10').
J. Fabricate corner pieces with eighteen inch (18") extensions, metered and sealed by forming as one piece.
K. Surface sand flange prior to applying any primers on Kynar metal.
L. Backpaint flashing in contact with masonry or dissimilar materials with bituminous paint.
M. Install new metal rooftop projections. New rooftop projection details shall be as recommended in NRCA or SMACNA handbooks. All rooftop projections shall be cleaned, all joints sealed, and painted with a rust inhibitive paint. Standard color to be selected by the Owner/Project Consultant.
N. All sheet metal shall be sealed and watertight.
O. Metal work should be secured so as to prevent damage from buckling or wind. Where clips are shown, these are to be continuous.

P. All metal to receive bitumen or adhesive shall be first primed with asphalt primer.

Q. All prefinished metal shall be sanded and/or abraded prior to receiving primer.

R. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges are to be seamed, form seams, and soldered.

S. Expansion Provisions: Form expansion joints of intermeshing hooked flanges, not less than one inch (1") deep, filled with mastic sealant (concealed within joints).

T. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with industry standards.

U. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

V. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

3.4 INSTALLATION

A. General: All sheet metal termination to vertical wall shall have a through-wall with receiver installed on masonry walls or prefabricated “Z” bar flashing pre-installed to fluid applied wall finished prior to installation of sheet metal termination. This applies to edge metal, base flashing closures and all vertical surface intersections. Refer to NRCA, SMACNA, and metal manufacturer's guidelines.

B. Gravel Guard/Fascia:
   1. Shall be installed with expansion joints, ten feet (10') on center, one-fourth inch (1/4") expansion leeway, with a cover plate.
   2. Secure metal flashings per specifications.
   3. Lock seams and end joints.
   4. Form sections identical to profiles as shown or approved similar, to match existing building.
   5. Fabricate corner pieces with minimum eighteen inch (18"), maximum forty-eight inch (48") extensions, formed and sealed with rivets and sealant, as one piece.
   7. Backpaint flashing in contact with masonry or dissimilar materials with bituminous paint. Surface sand before applying primers.
   8. Integrate flashing in a manner consistent with detailing.
   9. Provide and install continuous clip around perimeter.
  10. Apply sealant at horizontal juncture of gravel guard metal to exterior vertical wall.
  11. Shall be fabricated in accordance with all SMACNA provisions.
  12. Install bead of sealant at metal edge juncture at exterior wall surface.

C. Coping:
   1. Install new metal coping as required for a permanent watertight installation.
   2. All coping shall be pre-manufactured with low profile standing seam metal.
   3. Shall be minimum 24-gauge prefinished Kynar installed in ten foot (10') sections maximum.
   4. Vertical fascia shall extend minimum two and one-half inches (2-1/2") or be minimum one and one-half inches (1-1/2") below bottom of nailer, whichever is greater.
   5. Secure metal flashings per specifications and to meet ES-1.
   6. Lock seams and end joints.
   7. Form sections identical to profiles as shown or approved similar, to match existing building.
   8. Fabricate corner pieces with minimum eighteen inch (18"), maximum forty-eight inch (48") extensions, formed and sealed with rivets and sealant, as one piece.
  10. Backpaint flashing in contact with masonry or dissimilar materials with bituminous paint. Surface sand before applying primers.
  11. Integrate flashing in a manner consistent with detailing.
  12. Provide and install continuous clip, minimum 22-gauge.
  13. Apply sealant at horizontal juncture of coping metal to exterior vertical wall.
14. Shall be fabricated in accordance with all SMACNA provisions.
15. Install bead of sealant at metal edge juncture at exterior wall surface.

D. Expansion Joint Field and at Wall:
1. Shall be as outlined by details, and be in full compliance with all provisions of SMACNA and FM Global requirements for attachment, installation and recommendations.
2. Secure metal flashings per specifications.
3. Lock seams and end joints.
4. Form sections identical to profiles as shown or approved similar, to match existing building.
5. Fabricate corner pieces with minimum eighteen inch (18”), maximum forty-eight inch (48”) extensions, formed and sealed with rivets and sealant, as one piece.
7. Backpaint flashing in contact with masonry or dissimilar materials with bituminous paint. Surface sand before applying primers.
8. Integrate flashing in a manner consistent with detailing.
9. Provide and install continuous clip around perimeter.
10. Shall be fabricated in accordance with all SMACNA provisions.

E. Counterflashing: Install new metal counterflashing as required for a permanent watertight installation.

F. Gutter and Downspout:
1. Fabrication:
   a. Fabricate gutter and downspout of profile and size indicated.
   b. Field measure site conditions prior to fabricating work.
   c. Fabricate with required connection pieces.
   d. Fabricate section square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance.
   e. Hem exposed edges of metal.
   f. Form and seal all metal joints; provide for expansion joints per SMACNA.
2. Installation:
   a. Install collector head, downspout, and accessories. Coordinate location with Architect prior to installation.
   b. Join lengths with seams pop riveted and sealed watertight. Flash and seal collector head to downspouts and accessories.
   c. Seal all metal joints watertight for full metal surface contact.
   d. Collector Head: SMACNA style profile; submit detail for approval.
   e. Downspouts: Rectangular profile. Seal all joints, eight inches by eight inches (8” x 8”) minimum except at canopies, where they are to be four inches by four inches (4” x 4”) minimum.
   f. Support Brackets, Joint Fasteners: Profiled to suit gutters and downspouts.
   g. Anchorage Devices: SMACNA requirements. Type recommended by fabricator.
   h. Collector Head Support - Kynar: Color and Finish to match, as recommended by SMACNA.
   i. Downspout Supports - Straps, Kynar: Color and Finish to match.

G. Pitch Pans:
1. Install pitch pans of 14-gauge stainless steel according to NRCA standards, minimum of six inches by six inches (6” x 6”).
2. Pitch pans shall be fabricated to minimum of four inches (4”) above the finished roof membrane. Seams of pitch pans shall be soldered on each side.
3. Mastic shall be applied under pitch pan flange a minimum of one-half pound (1/2#) per linear foot.
4. All metal flanges shall be primed with asphalt primer prior to flashing installation. Inside of pitch pan shall be cleaned and primed as required by pitch pan sealant manufacturer.
5. All projections enclosed in pitch pans shall be cleaned in any manner suitable and coated with a rust inhibitive coating as approved by the Owner/Project Consultant. Coating shall be allowed to dry prior to pitch pan fill.
6. Base of pitch pans shall be filled with nonferrous, non-shrink grout to proper height and allowed to cure.
7. Top finish fill shall be self-leveling, one-part urethane, with maximum fill to within three-eighths inch (3/8”) of top of pitch pan sides.
8. Strip metal flange of pitch pan with one strip of Type IV fiberglass felt set in hot bitumen extending from the outer edge of the flange a minimum of three inches (3”) inward to base of pitch pan.
9. Strip in fiberglass felt with granulated modified bitumen flashing set in hot asphalt extending from the outer edge of the Type IV fiberglass underlayment a minimum of three inches (3”) inward to the base of the pitch pan.
H. Bonnets/Hoods:
   1. Fabricate and install above all pitch pans, where necessary, or reinstall as applicable, metal bonnets over all pitch pans, NO EXCEPTIONS.
   2. Bonnets/Hoods shall be manufactured with metal compatible with metal to which bonnet is to be attached.
   3. On beams and other steel, weld in place bonnets fabricated from one-fourth inch (1/4") steel plate.
   4. Draw band bonnets fabricated from 14-gauge stainless steel shall be used on circular projections.

3.5 **FINISH**

A. Backpaint concealed metal surfaces with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals. Exposed surfaces to be provided with a factory applied fluorocarbon Kynar finish meeting ASTM A 446 and AAMA specification 605.2 for high performance coating.

B. New 22-gauge hot-dipped galvanized metal shall be painted on all locations visible from the ground with an industrial grade paint to match existing, or standard color selected by Owner/Project Consultant. Galvanized metal surface must be properly prepared by removing all oil, grease, and/or protective mill coatings by solvent cleaning surface in accordance with SSPC-SP1, and according to paint manufacturer’s recommendation, to ensure proper adhesion of paint to metal.

END OF SECTION 07 62 00
SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Roof hatches.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for metal vertical ladders, ships’ ladders, and stairs for access to roof hatches.
2. Division 6 Section "Rough Carpentry" for roof sheathing, wood cants, and wood nailers.
3. Division 7 low-slope roofing Sections for roofing accessories.
4. Division 7 Section "Sheet Metal Flashing, Trim and Accessories" for shop- and field-fabricated metal flashing and counterflushing, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

1.4 QUALITY ASSURANCE

A. Standards: Comply with the following:

1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.
1.7 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

1. With Architect’s approval, adjust location of roof accessories that would interrupt roof drainage routes or roof expansion joints.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coated and mill phosphatized for field painting.

B. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

A. Glass-Fiber Board Insulation: ASTM C 726, 1 inch (25 mm) thick.

B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

D. Polyethylene Sheet: 6 mil (0.15 mm) thick, polyethylene sheet complying with ASTM D 4397.

E. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

F. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

G. Gaskets: Manufacturer’s standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C 920, silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

I. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.4 ROOF HATCHES

A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
2. Loads: Fabricate roof hatches to withstand 40 lbf/sq. ft. (1.9 kPa) external and 20 lbf/sq. ft. (0.95 kPa) internal loads.
3. Type and Size: Single-leaf lid, 30 by 36 inches (750 by 900 mm).
4. Curb and Lid Material: Galvanized steel sheet, 0.079 inch (2.0 mm) thick.
5. Insulation: Glass-fiber board.
6. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
7. Fabricate units to minimum height of 12 inches (300 mm), unless otherwise indicated.
8. Sloping Roofs: Where slope or roof deck exceeds 1/4 inch per foot (1:48), fabricate hatch curbs with height tapered to match slope to level tops of units.
9. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
10. Safety Railing System: Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, and all accessories required for a complete installation.
   a. Test Load: As required by authorities having jurisdiction.
   b. Height: 42 inches (1060 mm) above finished roof deck.
   c. Pipe or Tube: 1-1/4 inch (31 mm) ID galvanized pipe or 1-5/8 inch (41 mm) OD galvanized tube.
   d. Flat Bar: 2 inch (50 mm) high by 3/8 inch (9 mm) thick galvanized steel.
   e. Chain Passway Enclosure: Galvanized proof coil chain with quick link on fixed end.
   f. Pipe Ends and Tops: Covered or plugged with weather-resistant material.
   g. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
   h. Fabricate joints that will be exposed to weather in a watertight manner.
   i. Close exposed ends of handrail and railing members with prefabricated end fittings.
   j. Fasteners: Manufacturer's standard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
2. Verify dimensions of roof openings for roof accessories.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.
C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Roof Hatch Installation:

1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
2. Attach safety railing system to roof hatch curb.

F. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

3.3 TOUCH UP

A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 9 painting Sections.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 07 72 00
SECTION 078100 - SPRAYED FIRE-RESISTIVE MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Exposed sprayed fire-resistive materials.

B. Related Sections include the following:

1. Division 3 Section "<Cast-in-Place Concrete> <Plant-Precast Structural Concrete>" for concrete protecting structural steel.
2. Division 4 Section "Unit Masonry Assemblies" for masonry protecting structural steel.
3. Division 5 Section "Structural Steel" for surface conditions required for structural steel receiving sprayed fire-resistive materials.
4. Division 7 Section "Building Insulation" for fire-safing insulation.
5. Division 7 Section "Through-Penetration Firestop Systems" for fire-resistance-rated firestopping systems.
6. Division 7 Section "Fire-Resistive Joint Systems" for fire-resistance-rated joint systems.
7. Division 9 Section "Gypsum Board Assemblies" for gypsum-board-based fire protection.

1.3 DEFINITIONS

A. Concealed Sprayed Fire-Resistive Materials: Applied to surfaces that are concealed from view behind other construction when the Work is completed.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Structural framing plans indicating the following:

1. Locations and types of surface preparations required before applying sprayed fire-resistive material. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including the following:

   a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.

   b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.

   c. Designation of restrained and unrestrained conditions based on definitions in ASTM E 119, Appendix X3 as determined by a qualified professional engineer.

2. Treatment of sprayed fire-resistive material after application.

C. Product Certificates: For each type of sprayed fire-resistive material, signed by product manufacturer.

D. Qualification Data: For Installer, manufacturer, professional engineer, and testing agency.

E. Compatibility and Adhesion Test Reports: From sprayed fire-resistive material manufacturer indicating the following:

1. Materials have been tested for bond with substrates.
2. Materials have been verified by sprayed fire-resistive material manufacturer to be compatible with substrate primers and coatings.

3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

4. Provide a test application of fire-resistive material COMBINED with sprayed applied thermal foam insulation to determine adhesion and compatibility between the materials.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed sprayed fire-resistive materials.

G. Research/Evaluation Reports: For sprayed fire-resistive materials.

H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its sprayed fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility for designation of restrained and unrestrained conditions.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain sprayed fire-resistive materials through one source from a single manufacturer.

D. Sprayed Fire-Resistive Materials Testing: By a qualified testing and inspecting agency engaged by Contractor or manufacturer to test for compliance with specified requirements for performance and test methods.

1. Sprayed fire-resistive materials are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

2. Testing is performed on specimens of sprayed fire-resistive materials that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.

3. Testing is performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.

E. Compatibility and Adhesion Testing: Engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.


2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with sprayed fire-resistive material.

F. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing sprayed fire-resistive materials with appropriate markings of applicable testing and inspecting agency.

1. Fire-Resistance Ratings: Indicated by designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction, for sprayed fire-resistive material serving as direct-applied protection tested per ASTM E 119. UL Directory or
other documentation of the spray fire resistant design shall be “published by an organization in the country” and “applicable to the country” where the fire proofing will be applied.


G. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, “Polarized Light Microscopy.”

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers’ labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, aboveground, and kept dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperature is 40 deg F (4 deg C) or lower unless temporary protection and heat is provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of sprayed fire-resistive material. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.8 COORDINATION

A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosure as required to confine spraying operations and protect the environment.

2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.

3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.

4. Do not apply fire-resistive material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistant material.

5. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.

6. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.

7. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.

8. Do not install enclosing or concealing construction until after fire-resistant material has been applied, inspected, and tested and corrections have been made to defective applications.

1.9 WARRANTY

A. Special Warranty: Manufacturer’s standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace sprayed fire-resistant materials that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
1. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of sprayed fire-resistant materials from substrates.

2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

B. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

A. General: For concealed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and physical properties representative of installed products.

B. Products:

1. Cementitious Sprayed Fire-Resistive Material:
   c. Isolatex International Corp., Cafco Products; Cafco 300. 973-347-1200 [www.cafco.com]

C. Material Composition: As follows:

1. Cementitious sprayed fire-resistive material consisting of factory-mixed, dry formulation of gypsum or portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

D. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: 15 lb/cu. ft. (240 kg/cu. m) for average and individual densities regardless of density indicated in referenced fire-resistance design, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."

2. Thickness: Provide minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch (9 mm), per ASTM E 605:

   a. Where the referenced fire-resistance design lists a thickness of 1 inch (25 mm) or greater, the minimum allowable individual thickness of sprayed fire-resistant material is the design thickness minus 0.25 inch (6 mm).

   b. Where the referenced fire-resistance design lists a thickness of less than 1 inch (25 mm) but more than 0.375 inch (9 mm), the minimum allowable individual thickness of sprayed fire-resistant material is the greater of 0.375 inch (9 mm) or 75 percent of the design thickness.

   c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft. (240 kg/cu. m).

   d. Unless otherwise required by authorities having jurisdiction, average thicknesses shall be adjusted in accordance with ANSI/UL263 requirements for average thicknesses of fire-resistant material at steel beam and column sizes substituted for sizes shown in the most current applicable standard UL designs.
3. Bond Strength: 150 lbf/sq. ft. (7.2 kPa) minimum per ASTM E 736 under the following conditions:
   a. Field test sprayed fire-resistant material that is applied to flanges of wide-flange, structural-steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistant material.
   b. If surfaces of structural steel receiving sprayed fire-resistant material are primed or otherwise painted for coating materials, perform series of bond tests specified in UL's "Fire Resistance Directory." Provide bond strength indicated in referenced UL fire-resistance criteria, but not less than 150 lbf/sq. ft. (7.2 kPa) minimum per ASTM E 736.
   c. Minimum thickness of sprayed fire-resistant material tested in laboratory shall be 0.75 inch (19 mm).

4. Compressive Strength: 5.21 lbf/sq. in. (35.9 kPa) as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistant material tested shall be 0.75 inch (19 mm) and minimum dry density shall be as specified, but not less than 15 lb/cu. ft. (240 kg/cu. m).


6. Deflection: No cracking, spalling, or delamination per ASTM E 759.

7. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.

8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistant material is 0.75 inch (19 mm), maximum dry density is 15 lb/cu. ft. (240 kg/cu. m), test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.

9. Fire-Test-Response Characteristics: Provide sprayed fire-resistant materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 0.

10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

2.3 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistant materials that are compatible with sprayed fire-resistant materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: For use on each substrate and where recommended by manufacturer for use with each sprayed fire-resistant product, provide primer that complies with one or more of the following requirements:
   2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of sprayed fire-resistant material per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
   1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
2. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.

3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.

4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.

B. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of oil, rolling compounds, and other substances capable of interfering with bond.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.

B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, loose mill scale, and incompatible primers, paints, and encapsulants.

C. Prime substrates where recommended in writing by sprayed fire-resistive material manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive sprayed fire-resistive material.

D. For exposed applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished surface of sprayed fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 INSTALLATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Apply sprayed fire-resistive material that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.

C. Install metal lath, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by sprayed fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.

D. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by sprayed fire-resistive material manufacturer for material and application indicated.

E. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by sprayed fire-resistive material manufacturer, install body of fire-resistive covering in a single course.

F. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by sprayed fire-resistive material manufacturer.

G. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply sprayed fire-resistive material that differs in color from that of encapsulant over which it is applied.

H. Where sealers are used, apply products that are tinted to differentiate them from sprayed fire-resistive material over which they are applied.
3.4 INSTALLATION, CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

A. Apply concealed sprayed fire-resistant material in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if specified in Part 2 “Concealed Sprayed Fire-Resistive Materials” Article.

B. Apply water overspray to concealed sprayed-fiber fire-resistant material as required to obtain designated fire-resistance rating.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of completed applications of sprayed fire-resistant material shall take place in successive stages, in areas of extent and using methods as required by authorities having jurisdiction. Do not proceed with application of sprayed fire-resistant material for the next area until test results for previously completed applications of sprayed fire-resistant material show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.

1. If testing finds applications of sprayed fire-resistant material are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

C. Remove and replace applications of sprayed fire-resistant material where test results indicate that it does not comply with specified requirements for cohesion and adhesion, for density, or for both.

D. Apply additional sprayed fire-resistant material per manufacturer’s written instructions where test results indicate that thickness does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect sprayed fire-resistant material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.

C. Coordinate application of sprayed fire-resistant material with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect sprayed fire-resistant material and patch any damaged or removed areas.

D. Repair or replace work that has not been successfully protected.

END OF SECTION 078100
SECTION 078136 - THROUGH-PENETRATION FIRESTOP SYSTEMS

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 firestopping for the following:

1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Cast-In-Place Concrete" for construction of openings in concrete slabs.
2. Division 4 Section "Unit Masonry Assemblies" for joint fillers for non-fire-resistive-rated masonry construction.
3. Division 7 Section "Building Insulation" for safing insulation and accessories.
4. Division 7 Section "Joint Sealants" for non-fire-resistive-rated joint sealants.
5. Division 15 Sections specifying ducts and piping penetrations.
6. Division 16 Sections specifying cable and conduit penetrations.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.

B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per UL 1479, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per UL 1479, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:

1. Where firestop systems protect penetrations located outside of wall cavities.
2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
4. Where firestop systems protect penetrating items larger than a 4 inch (100 mm) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.

D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.
   1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
   1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
   2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer's fire protection engineer with modifications marked.

D. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.

E. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:

B. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.

C. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water (2.5 Pa) is maintained at a distance of 0.78 inch (20 mm) below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
   1. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
   2. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.

D. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water (2.5 Pa), as measured 0.78 inch (20 mm) from the face exposed to furnace fire. Provide systems complying with the following requirements:
1. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.

2. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.

E. Information on drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.

F. Installer Qualifications: Engage an experienced Installer who has completed firestopping that is similar in material, design, and extent to that indicated for Project and that has performed successfully.

G. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.

H. Field-Constructed Mockup: Prior to installing firestopping, erect mockups for each different through-penetration firestop system indicated to verify selections made and to demonstrate qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final installations.

1. Locate mockups on site in locations indicated or, if not indicated, as directed by Architect.
2. Notify Architect 1 week in advance of the dates and times when mockups will be erected.
3. Obtain Architect's acceptance of mockups before start of final unit of Work.
4. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging completed unit of Work.
5. When directed, demolish and remove mockups from Project site.
6. Accepted mockups in an undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

I. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

J. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

K. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

L. A qualified inspection agency shall check installed firestopping systems for compliance with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.
1.8 SEQUENCING AND SCHEDULING

A. Notify inspection agency at least 1 week in advance of firestopping installations; confirm dates and times on days preceding each series of installations.

B. Do not cover up those firestopping installations that will become concealed behind other construction until Owner’s inspection agency and authorities having jurisdiction, if required, have examined each installation.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:
   a. Semirefractory fiber (mineral wool) insulation.
   b. Ceramic fiber.
   c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
   d. Fire-rated formboard.
   e. Joint fillers for joint sealants.

2. Temporary forming materials.
5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Ceramic-Fiber and Mastic Coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.

B. Ceramic-Fiber Sealant: Single-component formulation of ceramic fibers and inorganic binders.


E. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.

G. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.

H. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogenous mortar.

I. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
J. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, nonshrinking foam.

K. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/ gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

L. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/ gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2. Products: Subject to compliance with requirements, provide one of the following:

   a. Ceramic-Fiber and Mastic Coating:
      1) FireMaster Bulk and FireMaster Mastic, Thermal Ceramics. (www.thermalceramics.com ) (866-785-2765)

   b. Endothermic, Latex Sealant:
      1) Fyre-Shield, Tremco, Inc. (www.tremcosealants.com ) (800-321-7906)

   c. Endothermic, Latex Compounds:

   d. Intumescent Latex Sealant:
      1) SpecSeal Triple S Intumescent Sealant, Specified Technologies Inc. (www.stifirestop.com) (800-992-1180)
      2) SpecSeal LCI Intumescent Sealant, Specified Technologies Inc. (www.stifirestop.com) (800-992-1180)
      4) Fire Barrier CP 25WB + Caulk, 3M Fire Protection Products. (www.3m.com/firestop ) (800-328-1687)
      5) Tremstop IA, Tremco, Inc. (www.tremcosealants.com ) (800-321-7906)

   e. Intumescent Putty:
      1) SpecSeal Series SSP Firestop Putty and Putty Pads, Specified Technologies Inc. (www.stifirestop.com) (800-992-1180)
      2) Flame-Safe FSP1000 Putty, International Protective Coatings Corp. (www.flamesafe.com ) (800-334-8796)
      3) Fire Barrier Moldable Putty +, 3M Fire Protection Products. (www.3m.com/firestop ) (800-328-1687)

   f. Intumescent Wrap Strips:
      1) SpecSeal Series SSW Wrap Strips, Specified Technologies Inc. (www.stifirestop.com) (800-992-1180)
      2) FS 601 Intumescent Wrap, Hilti Construction Chemicals, Inc. (www.us.hilti.com ) (800-879-8000)
      3) Fire Barrier FS-195 + Wrap/Strip, 3M Fire Protection Products. (www.3m.com/firestop ) (800-328-1687)

   g. Job-Mixed Vinyl Compound:
      1) USG Firecode Compound, United States Gypsum Co. (www.usg.com ) (800-874-4968)

   h. Mortar:
      1) SpecSeal Series SSM Mortar, Specified Technologies Inc. (www.stifirestop.com) (800-992-1180)
2) KBS-Mortar Seal, International Protective Coatings Corp. (www.flamesafe.com) (800-334-8796)

i. Pillows/Bags:
1) KBS Sealbags, International Protective Coatings Corp. (www.flamesafe.com) (800-334-8796)
2) Tremstop PS, Tremco, Inc. (www.tremcosealants.com) (800-321-7906)

j. Silicone Foams:
1) Fire Barrier 2001 Silicone ATV Foam, 3M Fire Protection Products. (www.3m.com/firestop) (800-328-1687)
2) Pensil 200 Foam, General Electric Co. (www.ge.com/silicones) (800-255-8886)

k. Silicone Sealants:
1) PENSIL Series PEN300 Silicone Sealant, Specified Technologies Inc. (www.stifirestop.com) (800-992-1180)
2) 2000 Silicone Sealant, 3M Fire Protection Products. (www.3m.com/firestop) (800-328-1687)
3) FS 601 Firestop Sealant, Hilti Construction Chemicals, Inc. (www.us.hilti.com) (800-879-8000)
6) Fyre-Sil, Tremco Inc. (www.tremcosealants.com) (800-321-7906)
7) Fyre-Sil S/L, Tremco Inc. (www.tremcosealants.com) (800-321-7906)

2.3 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

B. Sealant Colors: Provide color of exposed joint sealants to comply with the following:
   1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

D. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
   1. 50 percent movement in both extension and compression for a total of 100 percent movement.
   2. 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.

E. Multicomponent, Nonsag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage change in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
   a. 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement.
   b. 50 percent movement in both extension and compression for a total of 100 percent movement.

F. Single-Component, Nonsag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

G. Products: Subject to compliance with requirements, provide one of the following:
1. Single-Component, Neutral-Curing, Silicone Sealant:
   a. Dow Corning 790, Dow Corning Corp. (www.dowcorning.com)
   b. Dow Corning 795, Dow Corning Corp. (www.dowcorning.com)
   e. 864, Pecora Corp. (www.pecora.com) (713-686-8203)

2. Multicomponent, Nonsag, Urethane Sealant:
   b. Dynflex, Pecora Corp. (www.pecora.com) (713-686-8203)
   c. Dynatred, Pecora Corp. (www.pecora.com) (713-686-8203)
   e. Sikaflex 2cn NS, Sika Corp. (www.sikausa.com) (281-693-2121)
   g. Dymeric, Tremco Inc. (www.tremcosealants.com) (800-321-7906)

3. Single-Component, Nonsag, Urethane Sealant:
   a. Isoflex 880 GB, Harry S. Peterson Co., Inc. (800-521-2335)
   b. Isoflex 881, Harry S. Peterson Co., Inc. (800-521-2335)

2.4 MIXING

   A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

   A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

   A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

      1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
      2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
      3. Remove laitance and form release agents from concrete.

   B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

   C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.
3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. General: Comply with the “System Performance Requirements” article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
   1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. General: Comply with the “System Performance Requirements” article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 FIELD QUALITY CONTROL

A. Inspecting agency shall examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.

B. Inspecting agency will report observations promptly and in writing to Contractor and Architect.

C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.

D. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

3.6 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION 078136
SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

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 fire-resistive joint systems for the following:
   1. Head-of-wall joints.

B. Related Sections include the following:
   1. Division 5 Section "Architectural Joint Systems" for fire-resistive joint systems consisting of metal frames and preformed seals.
   2. Division 7 Section "Building Insulation" for perimeter fire-containment systems if not specified in this Section.
   3. Division 7 Section "Roof Expansion Assemblies" for fire-resistive roof expansion assemblies.
   4. Division 7 Section "Through-Penetration Firestop Systems" for systems installed in openings in walls and floors with and without penetrating items.
   5. Division 7 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: For joints in the following constructions, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed:
   1. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.

B. Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equaling or exceeding fire-resistance rating of constructions in which joints are located, as determined by UL 2079.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed and relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
   1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Compatibility and Adhesion Test Reports: From fire-resistive joint system manufacturer indicating the following:
   1. Materials forming joint substrates have been tested for compatibility and adhesion with fill materials.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fire-resistive joint systems for each kind of joint and construction condition indicated through one source from a single manufacturer.

B. Preconstruction Compatibility and Adhesion Testing: Submit to fire-resistive joint system manufacturers, for testing indicated below, samples of materials that will contact or affect fill materials.

1. Use manufacturer’s standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of fill materials to joint substrates.

2. Submit no fewer than nine pieces of each type of material, including joint substrates, forming materials, and miscellaneous materials.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, obtain fire-resistive joint system manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

C. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in "Performance Requirements" Article:

1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.

2. Fire-resistive joint systems are identical to those tested per UL 2079 and ICBO ES AC30 and are qualified for joint movement capabilities indicated in a current ICBO Evaluation Report by the ICBO Evaluation Service. Provide rated systems complying with the following requirements:

   1) Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.

   2) Fire-resistive joint systems correspond to those indicated by referencing system designations listed by the following:

      a) UL in its "Fire Resistance Directory."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers’ labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer’s written instructions by natural means or, if this is inadequate, forced-air circulation.
1.8 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

   1) Fire-Resistive Joint Systems:
      a) A/D Fire Protection Systems Inc. 800-263-4087 www.adfire.com
      b) Hilti, Inc. 800-333-1150 www.us.hilti.com
      c) ISOLATEK International. 201-347-1200 www.cafco.com
      d) Specified Technologies, Inc. 800-992-1180 www.stifirestop.com
      f) Tremco, Inc.800-263-6046 www.tremco.com
      g) W. R. Grace and Co., Construction Products Division, 866-333-3726 www.graceconstruction.com

2. At contractors option, an alternative product may be incorporated into the work in lieu of the systems above, subject to compliance with requirements:


2.2 FIRE-RESISTIVE JOINT SYSTEMS, GENERAL

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

2.3 FIRE-RESISTIVE JOINT SYSTEMS

A. Where UL-classified fire-resistive joint systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.

B. Head-of-Wall, Fire-Resistive Joint Systems:

   1. Provide UL-Classified Products of designation HW-D-(XXXX):

      1) Assembly Rating: To match or exceed adjacent wall rating unless otherwise indicated.
2) Nominal Joint Width: As indicated.
3) Movement Capabilities: Class I and as required to accommodate anticipated expansion and contraction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistant joint systems to comply with fire-resistant joint system manufacturer's written instructions and the following requirements:
   1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
   2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.
B. Priming: Prime substrates where recommended in writing by fire-resistant joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
C. Masking Tape: Use masking tape to prevent fill materials of fire-resistant joint system from contacting adjoining surfaces that will remain exposed after completing Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistant joint system materials. Remove tape as soon as possible without disturbing fire-resistant joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistant joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistant joint system manufacturer's written installation instructions for products and applications indicated.
B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
C. Install fill materials for fire-resistant joint systems by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
   2. Apply fill materials so they contact and adhere to substrates formed by joints.
   3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect fire-resistant joint systems and to prepare inspection reports.
1. Inspecting agency will state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.

B. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and inspecting agency has approved installed fire-resistive joint systems.

C. If deficiencies are found, repair or replace fire-resistive joint systems so they comply with requirements.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 078446
SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Extent of each form and type of joint sealer is indicated below and supplemental information shall be found on the drawings.

B. This Section includes joint sealers for the following locations:

1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:
   a. Control and expansion joints in cast-in-place concrete.
   b. Control and expansion joints in pre-cast concrete.
   c. Control and expansion joints in unit masonry.
   d. Joints between different materials listed above.
   e. Perimeter joints between materials listed above and frames of doors and windows.
   f. Control and expansion joints in ceiling and overhead surfaces.
   g. Other joints as indicated.

2. Exterior joints in horizontal traffic surfaces as indicated below:
   a. Control, expansion, and isolation joints in cast-in-place concrete slabs for floors and paving.
   b. Joints between different materials listed above.
   c. Other joints as indicated.

3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings.
   c. Joints between tops of non-load-bearing unit masonry walls and underside of structural deck and beams.
   d. Tile control and expansion joints.
   e. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
   f. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
   g. Perimeter joints of toilet fixtures.
   h. Other joints as indicated.

C. Sealing joints and penetrations for firestopping is specified in Division 7 Section "Firestopping" for through-penetration firestopping systems.

D. Sealing joints related to flashing and sheet metal for roofing is specified in Division-7 Section: "Sheet Metal Flashing, Trim, and Accessories".

E. Sealants for glazing purposes are specified in Division-8 Section "Glass and Glazing."

F. Sealing concealed perimeter joints of gypsum drywall partitions to reduce sound transmission characteristics is specified in Division-9 Section "Gypsum Drywall."

G. Sealing tile joints is specified in Division-9 Section "Ceramic Tile."

1.3 SYSTEM PERFORMANCES:

A. Provide joints sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.
1.4 SUBMITTALS:

A. Product Data from manufacturer's for each joint sealer product required, including instructions for joint preparation and joint sealer application.

B. Samples for Initial Selection Purposes: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.

C. Samples for verification purposes of each type and color of joint sealer required. Install joint sealer samples in 1/2 inch wide joints formed between two 6 inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealers.

D. Certificates from manufacturers of joint sealers attesting that their products comply with specification requirements and are suitable for the use indicated.

E. Qualification data complying with requirements specified in “Quality Assurance” article. Include list of completed projects with project name, addresses, names of Architects and Owners, plus other information specified.

F. Product test reports for each type of joint sealers indicated, evidencing compliance with requirements specified.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an Installer who has successfully completed within the last 3 years at least 3 joint sealer applications similar in type and size to that of this Project.

B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.

C. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of the Division-1 section covering this activity.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40 deg F (4.4 deg C).

2. When joint substrates are wet due to rain, frost, condensation or other causes.

B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than allowed by joint sealer manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 SEQUENCING AND SCHEDULING:

A. Sequence installation of joint sealers to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.
1.9 **WARRANTY**

A. General Warranty: 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. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

C. Warranty Period: Two years from date of Substantial Completion.

D. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

E. Warranty Period: 5 years from date of Substantial Completion.

F. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.

2. Disintegration of joint substrates from natural causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

**PART 2 - PRODUCTS**

2.1 **MATERIALS, GENERAL:**

A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide a color of exposed joint sealer as selected by Architect from manufacturer's standard colors.

2.2 **ELASTOMERIC JOINT SEALANTS:**

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class and Uses.

B. One-Part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide; intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.

1. Application: Interior vertical and non-traffic horizontal joints in wet areas (e.g. showers, kitchens, perimeter joints of toilet fixtures).

C. One-Part Nonsag Urethane Sealant for Use NT: Type S; Grade NS; Class 25; and Uses NT, M, A, and, as applicable to joint substrates indicated, O;

2. Application: Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:

   a. Control and expansion joints in cast-in-place concrete.
   b. Control and expansion joints in unit masonry.
   c. Joints between different materials listed above.
   d. Perimeter joints between materials listed above and frames of doors and windows.
e. Control and expansion joints in ceiling and overhead surfaces.
   f. Other joints as indicated.

D. One-Part Nonsag Urethane Sealant for Use T: Type S; Grade NS; Class 25, and complying with the following requirements for Uses:

1. Uses T, NT, A, and, as applicable to joint substrates indicated, O.
2. Application: Exterior horizontal joints subject to vehicular and pedestrian traffic. Interior horizontal joints subject to vehicular and pedestrian traffic and not indicated to receive expansion control assemblies.

E. Single Part Pourable Urethane Sealant for Use T (at exterior paving): Type S; Grade P; Class 25, and complying with the following requirements for Uses:

1. Uses T, A, and, as applicable to joint substrates indicated, O.
2. Application: Exterior horizontal joints subject to vehicular and pedestrian traffic.

F. Available Products: Subject to compliance with requirements, elastomeric sealants which may be incorporated in the Work include, but are not limited to, the following:

1. One-Part Mildew-Resistant Silicone Sealant:
   a. "Dow-Corning 786"; Dow Corning Corp. 517-496-4000 www.dowcorning.com
   c. "860 White"; Pecora Corp. 800-523-6688 www.pecora.com
   d. "Rhodoril 6B White"; Rhodia BSI.

2. One-Part Nonsag Urethane Sealant for Use NT:
   d. "Dynatrol I-XL"; Pecora Corp. 800-523-6688 www.pecora.com
   e. "Permapol RC-1"; Products Research & Chemical Corp.
   f. "Sikaflex-1a"; Sika Corp. 800-933-7452 www.sika.com
   h. "Sonolastic NP 1"; Sonneborn Building Products Div. of ChemRex, Inc. 800-243-6739 www.chemrex.com

3. One-Part Nonsag Urethane Sealant for Use T:
   b. "Permapol RC-1"; Products Research & Chemical Corp.
   c. "Sikaflex-1a"; Sika Corp. 800-933-7452 www.sika.com
   e. "NP 1"; Sonneborn Building Products Div., Chemrex Inc. 800-243-6739 www.chemrex.com

4. One Part Pourable Urethane Sealant for Use T (at exterior paving):
   b. "NR-201 Urexpan"; Pecora Corp. 800-523-6688 www.pecora.com
   c. "SL 2"; Sonneborn Building Products Div., Chemrex Inc. 800-243-6739 www.chemrex.com
   d. "Stonflex SN6"; Stonhard, Inc. 800-257-7953

5. Multicomponent Nonsag Urethane Sealant:
2.3 LATEX JOINT SEALANTS:

A. Acrylic-Emulsion Sealant: Manufacturer’s standard, one part, nonsag, acrylic, mildew-resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be painted and recommended for exposed applications on interior and on protected exterior locations involving joint movement of not more than plus or minus 5 percent.

1. Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:

Control and expansion joints on exposed interior surfaces of exterior walls.
Perimeter joints of exterior openings.
Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
Other joints as indicated.

B. Available Products: Subject to compliance with requirements, latex joint sealants which may be incorporated in the Work include, but are not limited to, the following:

1. Acrylic-Emulsion Sealant:
   b. “AC-20”; Pecora Corp. 800-523-6688 www.pecora.com
   c. “Sonolac”; Sonneborne Building Products Div.; Rexnord Chemical Products, Inc. 800-243-6739 www.chemrex.com

2.4 MISCELLANEOUS JOINT SEALANTS:

A. Acoustical Sealant for Concealed Joints: Manufacturer’s standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

B. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

1. Acoustical Sealants For Concealed Joints:
   a. “BA-98”; Pecora Corp. 800-523-6688 www.pecora.com

2.5 COMPRESSION SEALS:

A. Preformed Foam Sealant: Manufacturer’s standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellant agent; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:

1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, compatible with joint substrates and other joint sealers.
   a. Impregnating Agent: Manufacturer’s standard.
   b. Density: Manufacturer’s standard.

2. Backing: Where required, provide backings suitable for intended use, compatible with joint substrates and other joint sealers, designed to work in conjunction with primary sealants in dual-sealant systems.

3. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
   a. “Emseal”; Emseal Corp. 800-972-3677 www.emseal.com
   b. “Emseal Greyflex”; Emseal Corp. 800-972-3677 www.emseal.com
   e. “Will-Seal 150”; Will-Seal Construction Foams Div., Illbruck. +49-2171-391-258
   f. “Will-Seal 250”; Will-Seal Construction Foams Div., Illbruck. +49-2171-391-258
B. **Preformed Hollow Neoprene Gasket**: Manufacturer's standard preformed polychloroprene elastomeric joint seal of the open-cell compression type complying with ASTM D 2628 and with requirements indicated for size, profile and cross-sectional design.

1. **Available Manufacturers**: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
   b. The D.S. Brown Co. 419-257-3561 [www.dsbrown.com](http://www.dsbrown.com)

2.6 **JOINT SEALANT BACKING**:

A. **General**: Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. **Plastic Foam Joint Fillers**: Preformed, compressible, resilient, nonwaxing, nonextruding strips of flexible, nongassing plastic foam of material indicated below; nonabsorbent to water and gas; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Install only closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer, for cold-applied sealants only.

C. **Elastomeric Tubing Joint-Fillers**: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-15 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth and otherwise contribute to optimum sealant performance.

D. **Bond-Breaker Tape**: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 **MISCELLANEOUS MATERIALS**:

A. **Primer**: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer substrate tests and field tests.

B. **Cleaners for Nonporous Surfaces**: Provide nonstaining, chemical cleaners of type which are acceptable to manufacturer of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.

C. **Masking Tape**: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

2.8 **JOINT FILLERS FOR CONCRETE PAVING**:

A. **General**: Provide joint fillers of thickness and widths indicated.

1. **Bituminous Fiber Joint Filler**: Preformed strips of composition below, complying with ASTM D 1751:
   a. Asphalt saturated fiberboard.
PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellants; water; surface dirt and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALERS:

A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.

D. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications and conditions indicated.

E. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint-fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.

2. Do not leave gaps between ends of joint-fillers.

3. Do not stretch, twist, puncture or tear joint fillers.

4. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
5. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.

F. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.

G. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

H. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 6A in ASTM C 962, unless otherwise indicated.

2. Provide flush joint configuration per Figure 6B in ASTM C 962, where indicated.

3. Use masking tape to protect adjacent surfaces of recessed tooled joints.

4. Provide Recessed joint configuration per Figure 6C in ASTM C 962, of recess depth and at locations indicated.

I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrappings, taking care not to pull or stretch material, and complying with sealant manufacturer's directions for installation methods, materials and tools which produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

J. Installation of Preformed Hollow Neoprene Gaskets: Install gaskets, with minimum number of end joints, in joint recesses with edges free of spalls and sides straight and parallel, both within tolerances specified by gasket manufacturer. Apply manufacturer's recommended adhesive to joint substrates immediately prior to installing gaskets. For straight sections provide gaskets in continuous lengths; where changes in direction occur, adhesively splice gaskets together to provide watertight joint. Recess gasket below adjoining joint surfaces by 1/8 inch to 1/4 inch.

3.4 CLEANING:

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.5 PROTECTION:

A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.
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. Types of joints for which expansion joint systems are specified include the following:
   1. Interior pedestrian traffic joints.
   2. Interior wall and ceiling joints.
   3. Interior soffit joints.

B. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete" for block-outs and cast-in anchorage and frames for expansion joint systems in concrete floors, parking decks, and walls.
   2. Division 7 Section "Sheet Metal Flashing and Trim" for sheet metal roof and wall joint systems.
   3. Division 7 Section "Roof Expansion Assemblies" for factory-fabricated roof joint systems.
   4. Division 7 Section "Joint Sealants" for elastomeric sealants and preformed compressed-foam sealants without metal frames.

1.3 DEFINITIONS

A. Expansion Joint System: Any filler or cover used to span, fill, cover, or seal a joint, except expanding foam seals and poured or foamed in-place sealants.

B. Cyclic Movement: Periodic change between widest and narrowest joint widths in an automatically mechanically controlled system.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist passage of flame and hot gases through a movement joint.

D. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage of nominal value of joint width.

E. Nominal Joint Width: Width of linear gap indicated as representing the conditions existing when expansion joint systems will be installed or, if no nominal joint width is indicated, a width equal to the sum of maximum and minimum joint widths divided by two.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide factory-fabricated expansion joint systems capable of withstanding the types of loads and of accommodating the kinds of movement, and the other functions for which they are designed including those specified below, without failure. Types of failure include those listed in Appendix X3 of ASTM E 1399.
   5. Other Joints: Where indicated, provide joint systems that prevent penetration of water, moisture, and other substances deleterious to building components or content.
1.5 SUBMITTALS

A. Product Data: Include manufacturer’s product specifications, construction details, material and finish descriptions, and dimensions of individual components and seals.

B. Shop Drawings: For each joint system specified, provide the following:
   1. Placement Drawings: Include line diagrams showing entire route of each joint system, plans, elevations, sections, details, joints, splices, locations of joints and splices, and attachments to other Work. Where joint systems change planes, provide Isometric Drawings depicting how components interconnect to achieve continuity of joint covers and fillers.

C. Samples for Verification: Full-size units 6 inches (150 mm) long of each type of joint system indicated; in sets for each finish, color, texture, and pattern specified, showing the full range of variations expected in these characteristics.

D. Product Test Reports: From a qualified testing agency indicating expansion joint systems comply with requirements, based on comprehensive testing of current products.

E. Research/Evaluation Reports: Evidence of expansion joint system’s compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain expansion joint systems through one source from a single manufacturer. Coordinate compatibility with adjoining joint systems specified in other Sections.

B. Fire-Test-Response Characteristics: Where indicated, provide joint systems incorporating fire barriers that are identical to those of assemblies tested for fire resistance per ASTM E 119 and UL 2079, including hose-stream test of vertical wall assemblies, by a testing and inspecting agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: The design for each expansion joint system specified in Part 2 “Expansion Joint Systems” Article below is based on the products named. Subject to compliance with requirements, provide either the named products or comparable products by one of the other manufacturers listed.

2.2 MATERIALS

   1. Apply manufacturer’s standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Preformed Seals: Single or multicellular extruded elastomeric seals designed with or without continuous, longitudinal, internal baffles. Formed to be installed in frames or with anchored flanges, in color indicated or, if not indicated, as selected by Architect from manufacturer’s standard colors.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint.

D. Accessories: Manufacturer’s standard anchors, clips, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.
2.3 EXPANSION JOINT SYSTEMS

A. General: Provide joint systems of design, basic profile, materials, and operation indicated. Provide units with the capability to accommodate joint widths indicated and variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials.
2. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
3. Public Arena Seals: Non-slip seals designed for installation on treads and risers and to lie flat with adjacent surfaces, and complying with ADA guidelines for public areas.
4. Nominal Joint Widths: As indicated.
5. Type of Movement Capability: Expansion and contraction.
6. Cyclic-Movement-Test-Response Characteristics: No evidence of visual fatigue, inability to cycle between designated joint widths, or other types of failure as determined by testing products identical to those indicated per ASTM E 1399 including Appendix X3.
9. Fire-Resistance Ratings: For joint systems at rated conditions, provide manufacturer's standard fire barrier with a rating not less than that of adjacent construction.

B. Basis-of-Design Products: The design for each expansion joint system specified below is based on the products named. Subject to compliance with requirements, provide either the named products or comparable products by one of the following manufacturers:

1. Architectural Art Manufacturing, Inc (800) 835-0028 www.archart.com

C. Expansion Joint System: Metal frames and preformed seals for the following interior conditions:

1. Floor-to-Floor Joints.
   a. Basis-of-Design Product: Balco Inc.; “FS-100”.
2. Floor-to-Wall Joints:
   a. Basis-of-Design Product: Balco Inc.; “BHSL”.
3. Wall-to-Wall Joints:
   a. Basis-of-Design Product: Balco Inc.; “1W1”.
   b. Basis-of-Design Product: Balco Inc.; “1C1”.
4. Wall-to-Ceiling Joints:
   a. Basis-of-Design Product: Balco Inc.; “C1C1”.
5. Ceiling-to-Ceiling Joints:
   a. Basis-of-Design Product: Balco Inc.; “C1W1”.

2.4 FINISHES, GENERAL

A. Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
2.5 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Mill Finish: AA-M10 (Mechanical Finish: as fabricated; no other applied finish unless buffing is required to remove scratches, welding, or grinding produced in fabrication process.
   1. Provide at floor conditions unless otherwise indicated.

C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.
   1. Provide at wall, ceiling, and soffit conditions unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to expansion joint system manufacturer's written instructions.

B. Coordinate and furnish anchorages, Placement Drawings, and instructions for installing joint systems to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for handling and installing expansion joint assemblies and materials, unless more stringent requirements are indicated.

B. Coordinate installation of expansion joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required to install joint systems.
   1. Install joint cover assemblies in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
   2. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.
   3. Set covers in horizontal surfaces at elevations that place exposed surfaces flush with adjoining finishes.
   4. Locate wall, ceiling, and soffit covers in continuous contact with adjacent surfaces.
   5. Securely attach in place with required accessories.
   6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

D. Continuity: Maintain continuity of joint systems with a minimum number of end joints and align metal members. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials, if any, to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

E. Extruded Preformed Seals: Install seals to comply with manufacturer's written instructions and with minimum number of end joints.
   1. For straight sections, provide preformed seals in continuous lengths.
   2. Vulcanize or heat-weld field splice joints in preformed seal material to provide watertight joints using procedures recommended by manufacturer.
3. Apply adhesive, epoxy, or lubricant adhesive approved by manufacturer to both frame interfaces before installing preformed seals.

4. Seal transitions according to manufacturer's written instructions.

F. Seismic Seals: Install interior seals in continuous lengths. Install exterior seal in standard lengths and vulcanize or heat-weld field splice joints to provide watertight joints using manufacturer's recommended procedures. Seal transitions and end joints according to manufacturer's written instructions.

G. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and end joints.

3.3 CLEANING AND PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

END OF SECTION 079500
1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Steel doors.
2. Steel door frames.
3. Sidelight frames
4. Fire-rated door and frame assemblies.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for installing anchors and grouting frames in masonry construction.
2. Division 8 Section "Flush Wood Doors" for wood doors installed in steel frames.
3. Division 8 Section "Finish Hardware" for door hardware and weather stripping.
4. Division 8 Section "Glass and Glazing" for glass in glazed openings in doors and frames.
5. Division 9 Section "Gypsum Board Assemblies" for spot-grouting frames installed in steel-framed gypsum board partitions.
6. Division 9 Section "Painting" for factory-primed doors and frames.

1.3 DEFINITIONS

A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

B. Drawing Terminology: Unless otherwise indicated, the term “hollow metal” where indicated in the drawings refers to doors and door frames, window frames, borrowed lite frames, and other openings further described in this Section.

1.4 SUBMITTALS

A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.

B. Shop Drawings: Show the following:

1. Elevations of each door design.
2. Details of doors including vertical and horizontal edge details.
3. Frame details for each frame type including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Coordination of glazing frames and stops with glass and glazing requirements.

C. Samples for Verification: For each type of exposed finish required, prepare a sample not less than 3 by 5 inches (75 by 125 mm) and of same thickness and material indicated for final unit of Work.

D. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
E. Oversize Construction Certificates: For door assemblies required to be fire-protection rated and exceeding size limitations of labeled assemblies.

1.5 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. Fire-Rated Door Assemblies: Doors 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 NFPA 252.

1. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches (1000 mm) or less above the sill.

2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

3. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Doors and Frames:
   a. Amweld Building Products, LLC. 800-248-6116 www.amweld.com
   b. Ceco Door Products; a United Dominion Company. 214-503-0994 www.cecodoor.com
   d. Deansteel Manufacturing, Inc. 1-800-825-8271 www.deansteel.com
   f. Mesker Door, Inc. 256-851-6670 www.meskerdoor.com
   g. Pioneer Industries Inc. 201-933-1900 www.pioneerindustries.com
   h. Windsor Republic Doors. 800-733-3667 www.republicdoor.com
   i. Rocky Mountain Metals 505-445-2756 www.rockymountainmetals.com

2.2 MATERIALS

A. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

B. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.
2.3 **DOORS**

A. General: Provide doors of sizes, thicknesses, and designs indicated.

B. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

C. Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

D. Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

2.4 **FRAMES**

A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.

B. Frames of 0.053-inch- (1.3-mm-) thick steel sheet for:

1. Door openings wider than 48 inches (1220 mm).
2. Level 3 steel doors, unless otherwise indicated.
3. Wood doors, unless otherwise indicated.

C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.

D. Plaster Guards: Provide 0.016-inch- (0.4-mm-) thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

E. Supports and Anchors: Fabricated from not less than 0.042-inch- (1.0-mm-) thick, electrolytic zinc-coated or metallic-coated steel sheet.

1. Wall Anchors in Masonry Construction: 0.177-inch- (4.5-mm-) diameter, steel wire complying with ASTM A 510 (ASTM A 510M) may be used in place of steel sheet.

F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

G. For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop applied head and jamb seals.

H. For frames to be installed in interior partitions, such as sound doors on which sound seals will be applied and frame is shown to be installed in a masonry partition having mortar or grout, apply ½ inch rigid insulation in stop to facilitate installation of head and jamb seals.

2.5 **SIDE LIGHT FRAMES**

A. Provide panels of same materials, construction, and finish as specified for doors and frames.

2.6 **FABRICATION**

A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- (1.3-mm-) thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.

C. Interior Door and Panel Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from the following material:
   1. Cold-rolled steel sheet, unless otherwise indicated.

D. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
   1. Resin-impregnated kraft/paper honeycomb.
   2. Polyurethane.
   3. Polystyrene.
   4. Rigid mineral-fiber board.

E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

F. Clearances for Fire-Rated Doors: As required by NFPA 80.

G. Single-Acting, Door-Edge Profile: Beveled edge, unless square edge is indicated.


I. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

J. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

K. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
   1. Unless otherwise indicated, provide thermal-rated assemblies with U-value of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better.

L. Sound-Rated (Acoustical) Assemblies: Where shown or scheduled, provide door and frame assemblies fabricated as sound-reducing type, tested according to ASTM E 1408, and classified according to ASTM E 413.
   1. Unless otherwise indicated, provide acoustical assemblies with STC sound ratings of 33 or better.

M. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
   1. For concealed overhead door closers, provide space, cutouts, reinforcement, and provisions for fastening in top rail of doors or head of frames, as applicable.

N. Frame Construction: Fabricate frames to shape shown.
   1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints, unless otherwise indicated.
   2. Provide welded frames with temporary spreader bars.
   3. Provide terminated stops where indicated.

O. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

P. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
Q. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- (0.8-mm-) thick steel sheet.
   1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
   2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

R. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.7 FINISHES

A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
   1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
   2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
   3. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.
   4. For frames in interior partitions, such as frames for sound doors installed in masonry construction, ensure that inside web of frame throat at stop is filled with rigid insulation before grout is placed.
   5. In existing concrete or masonry construction, provide at least three completed opening anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
   6. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
   7. Install fire-rated frames according to NFPA 80.
   8. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.

C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
   1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
   2. Smoke-Control Doors: Install to comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 081113
SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Solid-core doors with wood-veneer.
   2. Factory finishing flush wood doors.

B. Related Sections include the following:
   1. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.
   2. Indicate dimensions and locations of cutouts.
   3. Indicate requirements for veneer matching.
   4. Indicate doors to be factory finished and finish requirements.
   5. Indicate fire ratings for fire doors.

C. Samples for Verification:
   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
   2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
   3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.


C. Fire-Rated Wood Doors: Doors 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 NFPA 252.
   1. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches (1000 mm) or less above the sill.
   2. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide oversize fire door label or certificate of inspection, from a testing and inspecting agency acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.
   3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.
D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.
B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect during the following period of time from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

   1. Flush Wood Doors:
      a. Algoma Hardwoods Inc. 800-678-8910 www.algomahardwoods.com
      b. Chappell Door Co. 740-335-2727
      c. Eggers Industries; Architectural Door Division. 920-793-1351 www.eggersind.com
      d. GRAHAM Manufacturing Corp. 641-423-2444 www.grahamdoors.com
      e. IPIK Door Company. 504-469-3666 www.ipikdoor.com
      f. Marshfield Door Systems Inc. 800-869-3667 www.marshfielddoors.com
      g. Mohawk Flush Doors, Inc. 828-277-0078 www.mohawkdoors.com
      h. Oshkosh Architectural Door Co. 972-596-7759 www.oshkoshdoor.com

2.2 DOOR CONSTRUCTION, GENERAL

A. Doors for Transparent Finish:
   1. Grade: Premium, with Grade A faces.
   4. Assembly of Veneer Leaves on Door Faces: Running match.
   5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
   6. Stiles: Same species as faces.
2.3 SOLID-CORE DOORS

A. Particleboard Cores: Comply with the following requirements:
   2. Blocking: Provide wood blocking in particleboard-core doors as follows:
      a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
      b. 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
      c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.

B. Interior Veneer-Faced Doors:
   1. Core: Particleboard.
   2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

C. Fire-Rated Doors:
   1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
   2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as follows:
      a. 5-inch (125-mm) top-rail blocking.
      b. 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
      c. 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
      d. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
   3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
   4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

2.4 LIGHT FRAMES

A. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed and approved for use in doors of fire rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
   1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
   1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
2.6 FACTORY FINISHING

A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.

B. Finish doors at factory.

C. Transparent Finish:
   1. Grade: Premium.
   2. Finish: AWI System TR-6 catalyzed polyurethane.
   4. Effect: Open-grain finish.
   5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416
SECTION 083113 – ACCESS DOORS AND FRAMES

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes access doors for installation in the following types of construction:
      1. Concrete floor.
      2. Gypsum wall board or veneer plaster wall, ceiling or soffit.
      3. Masonry wall.
   B. Related Sections: The following Sections contain requirements that relate to this Section:
      1. Division 4 Section “Unit Masonry Assemblies” for anchors and grouting of frames set in masonry construction.
      2. Division 7 Section “Roof Accessories” for roof hatches.
      3. Division 9 Section “Gypsum Board Assemblies” for gypsum wall board and framing.
      4. Division 22, Plumbing.
      5. Division 23, Mechanical.
      6. Division 26, Electrical.

1.3 SUBMITTALS
   A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
   B. Product data in form of manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions, and directions for installation of anchorage, devices.
      1. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.
   C. Shop drawings showing fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage and accessory items.
   D. Samples, 3 inches by 5 inches minimum size, of each panel face material showing factory-finished color and texture.

1.4 QUALITY ASSURANCE
   A. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.
   B. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.
   C. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

1.5 PROJECT CONDITIONS
   A. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.
   B. Special-Size Access doors: Use where required or requested, indicate on schedule.
PART 2 – PRODUCTS

2.1 FLOOR ACCESS DOORS

A. Basis-of-Design: K-5 (42 inch by 42 inch), The Bilco Company 972-644-2393 www.bilco.com, with accessory aluminum access ladder with safety rungs by access door manufacturer.

B. Floor Access Door Manufacturers: Subject to compliance with requirements, provide the named product, or a comparable product by one of the following:

1. The Bilco Company 972-644-2393 www.bilco.com

C. Floor Access Door Accessories Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

1. Alaco Ladder Company 888-0310-7040 www.alacoladder.com

D. Materials and Fabrication:

1. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.

2. Aluminum Access Doors and Frames for Floors: Provide floor access door with diamond texture. Frame shall be 1/4 inch extruded aluminum with built-in neoprene cushion and with strap anchors bolted to exterior. Door leaf shall be 1/4 inch aluminum diamond plate reinforced with aluminum stiffeners as required. Cast steel hinges shall be bolted to underside and pivot on torsion bars that counter balance the door for easy operation. The door shall open to 90 degrees and lock automatically in that position. A vinyl grip handle shall be provided to release the cover for closing. Doors shall be built to withstand a live load of 150 psf, and equipped with a snap lock, keyed lock cylinder, and removable handle. Aluminum shall be mill finish, with bituminous coating to be applied to exterior of frame by manufacturer. Hardware shall be zinc plated and chromate sealed.

3. Aluminum Access Ladders: Provide aluminum ladders suitable for underfloor access. Design side rails and safety rungs to comply with the applicable building codes. Provide bracing necessary for the safe support/suspension and use of the ladder. Include bracing to the ladder to stabilize the lower rungs. No portion of the bottom of the ladder shall touch grade. Design the ladder height to allow the lowest ladder rung to be within 12 inches of the grade under the floor.

2.2 WALL, CEILING, AND SOFFIT ACCESS DOORS

A. Wall, Ceiling, and Soffit Access Door Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

2. Cesco Products 888-422-3726 www.cescoproduets.com
6. Nystrom, Inc. 800-547-2635 www.nystrom.com
7. The Williams Brothers Corporation 416-299-7767 www.williams-brothers.com

B. Materials and Fabrication:

1. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.

2. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown. Frame shall be fabricated from 16 gage steel.

3. Fabricate frame with exposed flange nominal 1 inch wide around perimeter of frame for units installed in the following construction:

   a. Exposed concrete.
b. Exposed masonry.
c. Gypsum board drywall finish.
d. Ceramic tile finish.

1) Frames at exposed masonry locations shall be furnished with adjustable metal masonry anchors.
2) Frames at gypsum board drywall finish shall be perforated frames with drywall bead.

4. Flush Panel Doors: Fabricate from not less than 14 gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer’s factory-applied prime paint.

5. Recessed Panel Doors: Fabricate from not less than 18 gage sheet steel with face of panel formed to provide recess below surface of applied finish. Reinforce panel as required to prevent buckling. Finish with manufacturer’s factory-applied prime paint.

a. Furnish recessed panels for concealed installation in acoustic tile ceiling systems.

6. Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.

a. Provide one cylinder lock per access door. Furnish 2 keys per lock. Key all locks alike, unless otherwise scheduled or indicated.
b. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

7. Provide stainless steel access doors where indicated or scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer’s instructions for installation of access doors and ladders.

B. Coordinate installation with work of other trades.

C. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

D. Set Ladders perpendicular to floors and centered in openings. Brace ladder to floor structure above after floor door is secured, as recommended by ladder and access door manufacturers. Locate ladder to not interfere with normal operation of floor door.

3.2 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113
SECTION 08 35 13.23 – ACCORDION FOLDING FIRE DOORS (BASIS OF DESIGN – WON DOOR CORP)

PART 1 – GENERAL

1.01 SUMMARY OF WORK
   A. Furnish and install all horizontal sliding, accordion folding fire doors shown on the drawings and specified herein.

1.02 RELATED SECTIONS
   A. All headers, support structures, fire protection of support structures, surrounding insulation, jambs, storage pockets, blocking and trim shall be furnished and installed by other sections.
   B. All electrical wire, wiring, conduit and electrical boxes shall be furnished and installed by electrical section.
   C. Drilling/placement of anchorage points into pre or post tensioned decks, welding/punching/drilling steel members and all drywall work.
   D. All track, soffit, chain guide and wall mounted striker pieces and integrated pocket cover door surface shall be painted by Section 09900. Color shall be selected by the architect.

1.03 QUALITY ASSURANCE
   A. Installation shall be performed by factory trained and certified installers with a minimum of three years’ experience installing electrically operated accordion folding fire doors.
   B. Fire doors shall be listed by Underwriters Laboratories for ratings as indicated, when tested in accordance with the requirements of UL 10B NFPA 252.
   C. Automatic closing system shall be listed by Underwriters Laboratories in accordance with the requirements of UL 864 and be listed for use with the assembly in compliance with NFPA 80, Chapter 9.
   D. Fire doors used for smoke and draft control shall bear the “S” mark on the fire door label and shall have an air leakage of less than 3 ft$^3$/ft$^2$ at 0.1 inch of water column pressure when tested in accordance with UL 1784 with an artificial bottom seal.
   E. Fire doors used at the point of access to an elevator shall bear the “SE” mark on the fire door label and shall have an air leakage of less than 3 ft$^3$/ft$^2$ at 0.1 inch of water column pressure when tested in accordance with UL 1784 without an artificial bottom seal.
   F. Fire Doors shall be capable of resisting an air pressure differential up to 0.05 inches of water column. Air pressure resistance to 0.1 inches of water column available. (See Section 2.03 Error! Reference source not found.)

1.04 SUBMITTALS
   A. See Section 01 30 00 – Administrative Requirements, for submittal procedures.
   B. Product Data: Provide manufacturer’s technical literature, include UL listing data.
   C. Shop Drawings: Indicate construction and installation details and dimensions, including layout, electrical requirements, required stack depth, height of header above finished floor, and requirements for anchorage and support of each door.
   D. Operation and Maintenance Data: Operating procedures, troubleshooting and repair methods, and wiring diagrams.

1.05 DELIVERY, STORAGE, AND HANDLING
   A. Deliver to the job site in manufacturer’s original, unopened package, labeled to show name, brand and type.
   A. Store products in a protected dry location. Replace damaged materials on-site at no cost to owner.

1.06 COORDINATION BY GENERAL CONTRACTOR
   A. Coordinate with the following:
      1. Fire Alarm system.
2. Electrical.
3. Panel pocket doors finish and wood veneer paneling (if applicable).
4. Floor and ceiling finish.

B. Assure accurate installation of header, jamb, and trim. Provide “As-Built” dimensions for opening and storage pocket. Supervise unloading and handling of materials.

C. Store boxes flat (not more than three high) in a protected dry area. Replace damaged materials at no cost to owner.

D. Permanent power shall be in-place and ready for final connection when fire doors are installed. Assure access to and proper clearance for motor operators.

E. After testing the fire alarm system, automatic-closing fire doors shall be re-set to the original position.

1.07 WARRANTY

A. Materials and installation shall be warranted against defects in workmanship for a period of one (1) year from the date of substantial completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS (BASIS OF DESIGN)

A. Horizontal sliding accordion folding fire doors shall be Won-Door FireGuard Cross Corridor model FG-CC90 – number designates minutes of fire rating) as manufactured by Won-Door Corporation, Salt Lake City, UT.

2.02 ACCORDION FIRE DOORS – GENERAL

A. Provide electrically powered self-closing fire doors of configurations indicated on the drawings.
   1. Fire rating as required.

B. Fire Rating – Fire doors shall be listed by Underwriters Laboratory as special purpose fire doors having a 90 minute fire-resistive rating in accordance with the requirements of UL 10B and NFPA 252.

C. Closing and Opening Operation: Automatic Closing System including motor operator and releasing devices shall be a Microprocessor-based system rated to UL864 (Releasing Device Control Unit) and shall commence closing upon activation by fire alarm system and/or by low battery charge.
   1. Obstruction Detection: Contact with an obstruction shall cause the door to stop, reverse enough to remove pressure on the leading edge, pause, and then re-close when in an alarm condition.
   2. While the door is opening under motor power, constant pressure to the leading edge in the direction of opening shall cause the door to continue to open until the leading edge is released. This is termed motor-assisted opening.
   3. Constant pressure to the leading edge while not under motor power shall prevent motor operation and allow the door to be opened manually.

D. Exit Hardware Operation: Provide fire exit hardware on both sides of door.
   1. In emergency mode, a slight pressure on the hardware will cause the door to open a minimum of 32 inches, pause for 3 seconds, and then automatically close.
   2. The open distance shall be field programmable, up to the entire opening width, if the local authority requires an opening larger than 32 inches.
   3. The pause before re-close shall be field programmable, up to 30 seconds, if the local authority requires a longer pause time.
   4. The exit hardware shall have the ability when not in the emergency (fire) to be used to open the door and move it back into the storage pocket.
   5. The exit hardware shall be field programmable to provide access control. When programmed, the exit hardware shall not respond when pressed until activated by signal from smoke detector or fire alarm.
2.03 COMPONENTS

A. Door Construction: Two parallel, accordion-type walls independently suspended with no floor tracks, pantographs, or interconnections.
   1. Panels: 24 gauge steel, V-grooved; modular in design; capable of in-place repair.
   2. Perimeter Seals: shall consist of continuous extruded vinyl sweeps attached to the top and bottom of the fire door to form a smoke and draft seal.
   3. Hanging Weight: 5.5 pounds per sq. ft. when extended across opening.
   4. Finish: All steel parts factory-applied enamel.
   5. Color: Manufacturer’s standard platinum.

B. Suspension System: Two tracks, on 8 inch centers, attached to overhead structural support.
   2. Panel Hangers: Every other panel is suspended by a steel hanger pin and ball bearing roller.
   3. Lead Post Hangers: 16-gauge steel structural tube frame with 18-gauge steel preformed cover. The lead post shall function as an integrated cover panel over the storage pocket opening when the fire door is in the open position.

C. Power Supply: 12-volt maintenance-free DC battery, automatically maintained at capacity by continuous charger, 120 V AC.

D. Automatic Closing System shall be listed to UL864 including capability to send and receive signals from the Fire Control Panel, and shall consist of the following:
   1. Microprocessor based Electronic Control box with the ability to:
      a. Monitor dual power sources continually for peak performance including:
         1) Detect a missing battery, bad battery, or low battery condition.
         2) Detect if the charging circuit is bad.
         3) Detect fuse failures.
         4) Detect high or low AC conditions.
      b. Monitor the health of the drive train.
      c. Monitor inputs including: sticky door block, exit hardware, patron hardware, and key switches.
      d. Run a “watch dog” monitoring circuit which will force a software restart in the event the software hangs, including tracking the number of resets that occur for diagnostic purposes.
      e. Withstand voltages up to 120 volts AC on the fire alarm input circuit without damage including the ability to indicate that the alarm circuit has not been wired as a dry contact, “no voltage” circuit when errant voltages are applied to the circuit.
      f. Communicate with other microprocessors on the system via an internal buss system.
      g. Indicate faults or supervised information both locally and at a remote location.
   2. Motor Operator Assembly including a DC gear-motor, drive sprocket, clutch, and position sensors. The motor shall drive the fire door by means of a chain attached to a stabilizer bar trolley. The motor shall be rated for continuous use with unlimited cycle duty.
   3. If a key switch (NOTE: Section 2.03 G) is NOT used, A door control momentary rocker switch shall be mounted on one side of the door and shall function as follows:
      a. Pressing the upper portion shall close the door and/or clear fault conditions.
      b. Pressing the lower portion of the switch shall open the door and/or temporarily mute the local horn.
4. Leading Edge Obstruction Detector shall be pressure sensitive such that contact with an obstruction shall cause the door to stop, pause for 3 seconds, then re-close when in alarm mode. The obstruction detection system shall be fully functional at all times.

5. Exit Hardware will be located on both sides of each fire door.

E. The header shall be eliminated because of the Unitized Track System. Self-supporting track, threaded rods and mechanical attachment hardware are included.

F. Vision Panel located at the leadpost consisting of a frame and clear glass assembly with listings from Underwriters Laboratory up to 90 minutes.

G. A Key Switch shall be provided, located as directed by the Architect. *(Note: required with door equipped with Access Control option)*

H. Access Control: The Exit Hardware shall not respond when pressed until activated/over-ridden by signal from smoke detector or fire alarm. A rigid jamb stop and key switch shall be provided for authorized operation of the door assembly. A signal from the smoke detector or fire alarm will automatically override the access control feature. *(Note: at least one key-switch required.)*

2.04 RELATED CONSTRUCTION

A. Track Support Construction: Provide supports attached to structure and mounting surface for track including drilling/placement of anchorage points into pre or post tensioned decks, welding/punching/drilling steel members, and all drywall work; comply with door manufacturer’s instructions and recommendations.

A. Pocket Construction: Provide pocket for concealment of accordion door when open; comply with door manufacturer’s instructions and recommendations.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for installation of door.

A. Verify that electrical utilities have been installed and are accessible.

B. Verify that door opening is plumb and header is level and of correct dimensions.

C. Notify Architect of any unacceptable conditions or varying dimensions.

3.02 INSTALLATION

A. Install in accordance with manufacturer’s instructions, shop drawings and NFPA 80.

A. Install fire doors parallel with the finished floor.

3.03 ADJUSTING

A. Adjust door installation to provide uniform clearances and smooth, quiet, non-binding operation.

A. Test that all operations are functional and meet the requirements of local codes.

3.04 CLEANING

A. Clean surfaces using manufacturer’s recommended means and methods.

3.05 PROTECTION

A. Protect installed work from damage.

3.06 STORAGE OF WASTE AND RECYCLING

A. Store and recycle waste in accordance with Section 01 74 19 Construction Waste Management and Disposal.

END OF SECTION
SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS-WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes: Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

1. Types of Kawneer Aluminum Storefront Systems include:
   a. IR501 Storefront System – 2-1/2" x 5" (63.5 mm x 127 mm) nominal dimension; Non-Thermal; Center Plane for 1-5/16" (33.4 mm) Impact Resistant Glazing, Screw Spline Fabrication.

B. Related Sections:
   1. Division 072700 "Air Barriers"
   2. Division 078466 "Fire-Resistant Joint systems"
   3. Division 079200 "Joint Sealants"
   4. Division 084113 "Aluminum-Framed Entrances and Storefronts".

1.3 DEFINITIONS

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufactures Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed storefront system shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

   1. Design Wind Loads: Determine design wind loads applicable to the Project from basic wind speed indicated in miles per hour, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

      a. Basic Wind Speed (MPH): (______)
      b. Importance Factor (I, II, III): (______)
      c. Exposure Category (A, B, C, D): (______)

B. Storefront System Performance Requirements:

   1. Wind loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures of (______) lbs./sq. ft. inward and (______) lbs./sq. ft. outward. The design pressures are based on the (______) Building Code; (______) Edition.
   2. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 6.24 psf (300 Pa).
3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.

4. Uniform Load: A static air design load of 65 psf (3112 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/180 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.4% of their clear spans shall occur.

5. Windborne-Debris-Impact-Resistance Performance: Shall be tested in accordance with ASTM E 1886 and information in ASTM E 1996 and/or AAMA 506.
   a. Large-Missile Impact: For aluminum-framed systems located within 30 feet (9.1 m) of grade.
   b. Small-Missile Impact: For aluminum-framed systems located more than 30 feet (9.1 m) above grade.

6. Glazing and Glazing Systems Subjected to Airblast Loadings: The test specimen shall be tested in accordance with ASTM F 1642. The test specimen shall receive a minimum “Low Hazard” rating per ASTM F1642-04, a “Performance Condition 3b” per GSA and a “Low Level of Protection” per UFC 4-010-01.

7. Blast Mitigation: Provide system designed to meet or exceed the following requirements of the UFC 4-010-01 (6 October, 2003), “DoD Minimum Antiterrorism Standard for Buildings.”
   a. Section B-3.1 Standard 10: Windows, Skylights, and Glazed Doors. To minimize hazards from flying glass fragments, apply the provisions for glazing and window, skylight, and glazed door frames below for all new and existing inhabited buildings covered by these standards. Glazing and frames must work as a system to ensure that their hazard mitigation is effective. These provisions apply even if the minimum standoff distances are met. The specific requirements below provided conventional standoff distances are met, will result in windows, skylights, and glazed doors that comply with this standard for windows provided their visual glazing openings do not exceed 3 square meters (32 square feet).
   b. Section B-3.1.1 Glazing:
      Use minimum of 6-mm (1/4-in) nominal laminated glass for all exterior windows, skylights, and glazed doors. The 6-mm (1/4-in) laminated glass consists of two nominal 3-mm (1/8-in) glass panes bonded together with a minimum of a 0.75-mm (0.030-inch) polyvinyl-butyl (PVB) interlayer. For insulated glass units, use 6-mm (1/4-inch) laminated glass inner pane as a minimum.

1.5 SUBMISSIONS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum frame storefront system indicated.

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

C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum framed storefront system and components required.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, of aluminum framed storefront.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12” (300 mm) lengths of full-size components and showing details of the following:
   1. Joinery, including concealed welds.
   2. Anchorage.
   5. Flashing and drainage.
Other Action Submittals:

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

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of providing aluminum framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

C. Source Limitations: Obtain aluminum framed storefront system through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed storefront system and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.

   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect’s approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Build mockup for type(s) of storefront elevation(s) indicated, in location(s) shown on Drawings.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of aluminum framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.8 WARRANTY

A. Manufactures Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty.

   1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

EDITOR NOTE: CHOOSE IR500 OR IR501FRAMING

A. Basis-of-Design Product

   1. Kawneer Company Inc.
   2. IR500 (Non-Thermal) Storefront System
EDITOR NOTE: PROVIDE INFORMATION BELOW INDICATING APPROVED ALTERNATIVES TO THE BASIS-OF-DESIGN PRODUCT.

B. Subject to compliance with requirements, other manufacturers proving a comparable product are acceptable. Submit product substitution request as listed below in Paragraph C

C. Substitutions: Refer to Substitutions Section for procedures and submission requirements.
1. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
2. Post-Contract (Construction Period) Substitutions: Submit written request in order to avoid storefront installation and construction delays.
3. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
4. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for storefront system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum storefront for a period of not less than ten (10) years. (Company Name)
5. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
6. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

D. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070” wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

F. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 STOREFRONT FRAMING SYSTEM

A. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposes shall be stainless steel.

C. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

D. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
E. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing".

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: As recommended by manufacturer for joint type, and as follows:

1. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: As specified in Division 08 41 13 Section "Aluminum Framed Entrances".

B. Entrance Door Hardware: As specified in Division 08 41 13 Section "Door Hardware".

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants".

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil (0.762 mm) thickness per coat.

2.7 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fit joints; make joints flush, hairline and weatherproof.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

C. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

D. Storefront Framing: Fabricate components for assembly using manufacturers standard installation instructions.

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Factory Finishing:

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight sliding door installation.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum framed storefront system, accessories, and other components.

B. Install aluminum framed storefront system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

D. Install aluminum framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within sliding door to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.

1. Testing: Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.
   a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², whichever is greater.
   b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf (300 Pa).

B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.
3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Clean aluminum surfaces immediately after installing aluminum framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 084113
PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes Aluminum Entrance doors, glass and glazing, and door hardware and components.

1. Types of Kawneer Aluminum Entrances include – BASIS OF DESIGN:
   a. 350 Heavy Wall™ IR Swing Door; Medium stile, 3-1/2” (89 mm) vertical face dimension, 2” (51 mm) depth, 3/16” (5 mm) wall thickness for heavy traffic applications.

B. Related Sections:
   1. Division 072700 “Air Barriers” for materials used to bridge between aluminum sliding glass door and building intersection
   2. Division 078466 “Fire-Resistant Joint Systems” for fire resistant material installed between aluminum sliding door system and floor intersections
   3. Division 079200 “Joint Sealants” for joint sealants installed as part of the aluminum sliding door system
   4. Division 084113 "Aluminum-Framed Entrances and Storefronts"
   5. Division 084413 "Glazed Aluminum Curtain Walls"
   6. Division 087000 "Hardware"
   7. Division 088000 "Glazing"

1.3 DEFINITIONS
A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 PERFORMANCE REQUIREMENTS
A. General Performance: Aluminum-framed storefront system shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
   1. Design Wind Loads: Determine design wind loads applicable to the Project from basic wind speed indicated in miles per hour, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
      a. Basic Wind Speed (MPH): (______)
      b. Importance Factor (I, II, III): (______)
      c. Exposure Category (A, B, C, D): (______)

B. Aluminum-Framed Entrance Performance Requirements:
   2. Wind Loads: Provide storefront system; include anchorage, capable of
      a. Withstanding wind load design pressures of (______) lbs./sq. ft. inward
and (____) lbs./sq. ft. outward. The design pressures are based on the (____) Building Code; (____) Edition.

3. Air Infiltration: For single acting offset pivot or butt hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 6.24 psf (300 Pa) for single doors and 1.567 psf (75 Pa) for pairs of doors. A single 30" x 70" (915 mm x 2134 mm) entrance door and frame shall not exceed 0.50 cfm per square foot. A pair of 60" x 70" (1830 mm x 2134 mm) entrance doors and frame shall not exceed 1.0 cfm per square foot.

4. Structural Performance: Corner strength shall be tested per the Kawneer dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner integrity [Testing procedure and certified test results available upon request].

5. Uniform Load: A static air design load of 85 psf (4070 Pa), (65 psf (3113 Pa) for laminated infill) shall be applied in the positive and negative direction in accordance with Florida Building Code TAS202 and ASTM E 330. There shall be no deflection in excess of L/180 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage shall occur.

6. Blast Mitigation Performance: tested in accordance with ASTM F 1642 Standard Method for Glazing and Glazing Systems Subjected to Airblast Loading at a peak blast pressure of 5.8 psi and positive phase impulse of 42 psi/msec. The test specimen shall receive a minimum “Low Hazard” rating per ASTM F1642-04, a “Performance Condition 3b” per GSA, and a “Low Level of Protection” per UFC 4-010-01.

7. Unified Facilities Criteria:
   a. Blast Mitigation: Provide system designed to meet or exceed the following requirements of the UFC 4-010-01 (latest edition), “DoD Minimum Antiterrorism Standard for Buildings.
   b. Wind Loads: Provide immediate door framing for swing doors, including anchorage, capable of withstanding wind-load design pressures as determined per UFC 3-301-01 Structural Engineering.

1.5 SUBMITTALS
A. Product Data: Include construction details, material descriptions, and fabrication methods, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum-framed entrance door indicated.
B. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.
C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.
D. Samples for Verification: For sliding aluminum-framed glass door and components required.
E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of aluminum-framed entrance doors. Test results based on use of downsized test units will not be accepted.
F. Warranty: Special warranty specified in this Section.

G. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12" (300 mm) lengths of full-size components and showing details of the following:
1. Joinery, including welds.
2. Anchorage.

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

1.6 QUALITY ASSURANCE
A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum-framed entrance doors and storefronts that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

C. Source Limitations: Obtain sliding aluminum-framed glass door through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum-framed glass entrance doors and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup for type(s) of swing entrance door(s) indicated, in location(s) shown on Drawings.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS
A. Field Measurements: Verify actual dimensions of sliding aluminum-framed glass door openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.8 WARRANTY
A. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty.
1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:
   1. Kawneer Company Inc.
   2. The door stile and rail face dimensions of the 350 Heavy Wall™ IR follows:
      | Door | Vertical Stile | Top Rail | Bottom Rail |
      | 350  | 3-1/2" (89 mm) | 3-1/2" (89 mm) | 6-1/2" (166 mm) |
   3. Major portions of the door members to be 0.188" (5 mm) nominal in thickness and
      glazing molding to be 0.05" (1.5 mm) thick.
   4. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic
      elastomer.
   5. Structural silicone sealant to be DOW 995 or Tremco Proglaze SSG.

B. Subject to compliance with requirements, other manufacturers with a comparable
   product will be considered. Provide a request for substitution as described in
   Paragraph C below:

C. Substitutions: Refer to Substitutions Section for procedures and submission requirements
   1. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10)
      days prior to bid date.
   2. Post-Contract (Construction Period) Substitutions: Submit written request in
      order to avoid storefront installation and construction delays.
   3. Product Literature and Drawings: Submit product literature and drawings
      modified to suit specific project requirements and job conditions.
   4. Certificates: Submit certificate(s) certifying substitute manufacturer (1)
      attesting to adherence to specification requirements for storefront system
      performance criteria, and (2) has been engaged in the design, manufacturer
      and fabrication of aluminum storefronts for a period of not less than ten (10)
      years. (Company Name)
   5. Test Reports: Submit test reports verifying compliance with each test
      requirement required by the project.
   6. Samples: Provide samples of typical product sections and finish samples in
      manufacturer's standard sizes.

D. Substitution Acceptance: Acceptance will be in written form, either as an addendum or
   modification, and documented by a formal change order signed by the Owner and
   Contractor.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by sliding aluminum-framed
   glass door manufacturer for strength, corrosion resistance, and application of
   required finish and not less than 0.090" wall thickness at any location for the main
   frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-
   corrosive and compatible with sliding aluminum-framed glass door members, trim
   hardware, anchors, and other components.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-
   coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions
   or other suitable zinc coating; provide sufficient strength to withstand design
D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
   1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.

2.3 STOREFRONT FRAMING SYSTEM
A. Storefront Entrance Framing (1600 System®1 with door sub-frames).
B. Non-Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
D. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
E. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
F. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

2.4 GLAZING
A. Glazing: As specified in Division 08 Section "Glazing."
   1. 9/16" (14.3mm) laminated infill with 0.090" (3 mm) PVB interlayer.
B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.
C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.5 HARDWARE
A. General: Provide manufacturer’s standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum-framed entrance doors.
B. Standard Hardware:
   1. Weatherstripping:
      a. Meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.
      b. The door weathering on a single acting offset pivot or butt hung door and frame (single or pairs) shall be Kawneer Sealair® weathering. This is comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
   2. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners (Necessary to meet specified performance tests).
3. Threshold: Extruded aluminum, one piece per door opening, with ribbed surface.
4. Butt Hinge: 3 per leaf.
5. Push/Pull: [___________] style.
7. Closer: Surface or concealed closer (concealed closer with non-transom and non-sidelite Trifab® VG 450 (Center) or 1600 Wall sub-frames).
8. Cylinder(s)/Thumbturn: Kawneer standard.

2.6 FABRICATION
A. Fabricate aluminum-framed glass entrance doors in sizes indicated. Include a complete system for assembling components and anchoring doors.
B. Fabricate aluminum-framed glass doors that are reglazable without dismantling perimeter framing.
1. Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8" (29 mm) long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord.
2. Accurately fit and secure joints and corners. Make joints hairline in appearance.
3. Prepare components with internal reinforcement for door hardware.
4. Arrange fasteners and attachments to conceal from view.
C. Weather Stripping: Provide weather stripping locked into extruded grooves in door panels or frames as indicated on manufacture’s drawings and details.

2.7 FINISHES, GENERAL
A. Comply with AAMA-AFPA “Anodic Finishes/Painted Aluminum” for recommendations for applying and designating finishes.
B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES
A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
B. Factory Finishing:

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a
coordinated, weather tight sliding door installation.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum swing entrance doors, hardware, accessories, and other components.
B. Install aluminum swing entrance doors level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
C. Set sill threshold in bed of sealant, as indicated, for weather tight construction.
D. Separate aluminum and other corroding surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL
A. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.4 ADJUSTING, CLEANING, AND PROTECTION
A. Clean aluminum surfaces immediately after installing aluminum framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 084113.1
SECTION 08 44 13 GLAZED ALUMINUM CURTAIN WALLS

PART 1 – GENERAL

1.01 Summary

A. Section Includes: Aluminum Curtain Wall Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.

1. Types of Kawneer Aluminum Curtain Wall include – BASIS OF DESIGN:
   a. 1600 Wall System® – 2–1/2" (63.5) sightline, outside glazed pressure plate format.
   b. System depth 6" (152.4), 7-1/2" (190.5), or 10" (254) for 1" (25.4) insulating glazing.

B. Related Sections:
   1. Division 08 41 13 "Aluminum-Framed Entrances and Storefronts"
   2. Division 08 51 13 "Aluminum Windows"
   3. Division 08 70 00 "Hardware"
   4. Division 08 80 00 "Glazing"

1.02 References (Industry Standards)

A. ASTM International:

B. Unified Facilities Criteria (UFC):
   1. UFC 1-200-01: General Building Requirements.
   2. UFC 3-310-01: Design - Structural Load Data.
   3. UFC 4-010-01: DoD Minimum Antiterrorism Standards for Buildings.

1.03 System Description

A. Curtain Wall System Performance Requirements:
   1. Wind loads: Provide immediate door framing for swing doors, including anchorage, capable of withstanding wind-load design pressures as determined per UFC 3-310-01 Design - Structural Load Data.
   2. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 6.24 psf (300 Pa).
   3. Water Resistance, (static): The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a static air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.
   4. Water Resistance, (dynamic): The test specimen shall be tested in accordance with AAMA 501.1. There shall be no leakage at an air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.
   5. Uniform Load: A static air design load of 40 psf (1915 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
   6. Thermal Transmittance Test (U-value): When tested in accordance with AAMA Specification 1503, the conductive thermal transmittance (U-value) shall not be more than 0.66 BTU/hr/ft²°F.
   7. Condensation Resistance Test (CRF): When tested in accordance with AAMA Specification 1503, the condensation resistance factor (CRF) shall not be less than 66 for the frame and 60 for the glass.
   8. Sound Transmission Loss: When tested to ASTM E90 and E413, the Sound Transmission Class (STC) shall not be less than 34.
   9. Glazing and Glazing Systems Subjected to Airblast Loadings: The test specimen shall be tested in accordance with ASTM F 1642. The test specimen shall receive a minimum “Low Hazard” rating per ASTM F1642-04, a “Performance Condition 3b” per GSA and a “Low Level of Protection” per UFC 4-010-01.
   10. Blast Mitigation: Provide system designed to meet or exceed the following requirements of the UFC 4-010-01 (8 October, 2003), “DoD Minimum Antiterrorism Standard for Buildings.”

a. Section B-3.1 Standard 10: Windows, Skylights, and Glazed Doors. To minimize hazards from flying glass fragments, apply the provisions for glazing and window, skylight, and glazed door frames below for all new and existing inhabited buildings covered by these standards. Glazing and frames must work as a system to ensure that their hazard mitigation is effective. These provisions apply even if the minimum standoff distances are met. The specific requirements below provided conventional standoff distances are met, will result in windows, skylights, and glazed doors that comply with this standard for windows provided their visual glazing openings do not exceed 3 square meters (32 square feet).

b. Section B-3.1.1 Glazing:
   Use minimum of 6-mm (1/4-in) nominal laminated glass for all exterior windows, skylights, and glazed doors. The 6-mm (1/4-in) laminated glass consists of two nominal 3-mm (1/8-in) glass panes bonded together with a minimum of a 0.75-mm (0.030-inch) polyvinyl-butyl (PVB) interlayer. For insulated glass units, use 6-mm (1/4-inch) laminated glass inner pane as a minimum.
c. Section B-3.1.2.1 Frame Member Design:
Steel members may be designed using ultimate yield stresses and aluminum members may be designed based on a 0.2% offset yield strength. Equivalent static design loads for the window, skylight, and door members shall be 7 kilopascals (1 lb per square in) applied to the surface of the glazing and frame. Deformations shall not exceed 1/60 of the unsupported member lengths.

d. Section B-3.1.2.2 Glazing Frame Bite:
The glazing shall have a minimum frame bite of 9.5-mm (3/8-in) for structurally glazed systems and 25-mm (1-in) for window systems that are not structurally glazed.

e. Section B-3.1.2.2 Connection Design:
Equivalent static design loads for connections of the window, skylight, or door frame to the surrounding walls or roof, hardware and associated connections, and glazing stop connections shall be 75 kilopascals (10.8 lbs per square inch) for glazing panels with a vision area less than or equal to 1.0 square meters (10.8 square feet) and 30 kilopascals (4.4 lbs per square inch) for glazing panels with a vision area greater than 1.0 square meters (10.8 square feet) but less than or equal to 3.0 square meters (32 square feet). Loads shall be applied to the surface of the glazing and frame. Connections and hardware may be designed based on ultimate strength for steel and 0.2% offset yield strength for aluminum.

f. Section B-3.3 Standard 12 Exterior Doors:
For all new and existing buildings covered by these standards, ensure that all exterior doors into inhabited areas open outwards. By doing so, the doors will seat into the door frames in response to an explosive blast, increasing the likelihood that the doors will not enter the buildings as hazardous debris. Alternatively, position doors such that they will not be propelled into rooms if they fail in response to a blast or provide other means to ensure they do not become hazards to building occupants.

1.04 Submittals
A. Product Data: For each product specified, include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
B. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, glazing details, and attachment to other work. Shop drawings are to be prepared by the manufacturer.
C. Provide structural analysis data demonstrating system ability to sustain specified loading. Calculations must include analysis of members and internal system connections; as well as attachment of the framing members to the main building. Provide structural calculations that bear a professional engineer stamp with a license in the State of Texas.
D. Samples: Provide samples of each type of product section and exposed finish required in manufacturer’s standard sizes.
E. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.

1.05 Warranty
A. Project Warranty: Refer to “Conditions of the Contract” for project warranty provisions.
B. Manufacturer’s Product Warranty: Submit, for Owner’s acceptance, manufacturer’s warranty for curtain wall system as follows:
   1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by Kawneer.

1.06 Quality Assurance
A. Qualifications:
   1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
   2. Manufacturer Qualifications: Manufacturer capable of providing structural calculations, applicable independent product test reports, installation instructions, a review of the application method, customer approval and periodic field service representation during construction.
B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer’s installation instructions, and manufacturer’s warranty requirements.

1.07 Delivery, Storage, and Handling
A. Ordering: Comply with manufacturer’s ordering instructions and lead time requirements to avoid construction delays.
B. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.
C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after curtain wall installation.
PART 2 – PRODUCTS

2.01 Manufacturers – BASIS OF DESIGN

A. Manufacturers:
1. Kawneer Company, Inc.
   555 Guthridge Court,
   Technology Park/Atlanta,
   Norcross, GA 30092
   Telephone: 770 449 5555  Fax: 770 734 1560
2. Product(s)/System(s): Kawneer Aluminum Curtain Wall
   a. Series: 1600 Wall System, incorporating a 2-1/2" sightline and a nominal depth of 10" (254) for 1" (25.4) insulating glazing.
   c. Finish/Color: (See 2.06 Finishes)

B. Alternate (Manufacturers/Products): In lieu of providing a product from the BASIS OF DESIGN manufacturer, provide a request for substitution as follows.

C. Substitutions:
1. General: Refer to Substitutions Section for procedures and submission requirements.
   a. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
   b. Post-Contract (Construction Period) Substitutions: Submit written request in order to avoid curtain wall installation and construction delays.
2. Substitution Documentation
   a. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
   b. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for curtain wall system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum curtain wall for a period of not less than ten (10) years. (Company Name)
   c. Test Reports: Submit test reports verifying compliance with each test requirement for curtain wall required by the project.
   d. Product Sample and Finish: Submit product sample, representative of curtain wall for the project, with specified finish and color.
3. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.02 Materials

A. Aluminum (Curtain Wall and Components):
   1. Material Standard: Extruded Aluminum, ASTM B 221, 6063-T5 and/or 6063-T6 alloy and temper.
   2. Member Wall Thickness: Each framing member shall have a wall thickness sufficient to meet the specified structural requirements.
   3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.

2.03 Accessories

A. Fasteners: Where exposed, shall be Stainless Steel.
B. Gaskets: Glazing gaskets shall comply with ASTM C 864 and be extruded of a silicone compatible EPDM rubber that provides for silicone adhesion.
C. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
D. Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides for silicone adhesion. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
E. Steel Reinforcement: Complying with ASTMA 36/ A 36M for structural shapes, plates and bars; ASTM A611 for cold-rolled sheet and strip or ASTM A 570/ A 570M for hot-rolled sheet strip.

2.04 Related Materials

A. Sealants: Refer to Joint Treatment (Sealants) Section.
B. Glass: Refer to Glass and Glazing Section.
C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil (0.762 mm) thickness per coat.

2.05 Fabrication

A. General:
   1. Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
   2. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
4. Arrange fasteners and attachments to conceal from view.

2.06 Finishes
A. Shop Finishing:

2.07 Source Quality Control
A. Source Quality: Provide aluminum curtain walls specified herein from a single source.
   1. Building Enclosure System: When aluminum curtain wall are part of a building enclosure system, including entrances, entrance hardware, windows, storefront framing and related products, provide building enclosure system products from a single source manufacturer.

PART 3 – EXECUTION

3.01 Examination
A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer's acceptable tolerances.
   1. 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.

3.02 Installation
A. General: Install curtain wall systems plumb, level, and true to line, without warp or rack of frames with manufacturer's prescribed tolerances and installation instructions. Provide support and anchor in place.
   1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
   2. Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners.
   3. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.

B. Related Products Installation Requirements:
   1. Sealants (Perimeter): Refer to Joint Treatment (Sealants) Section.
   2. Glass: Refer to Glass and Glazing Section.

3.03 Field Quality Control
A. Field Tests: Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
   1. Testing: Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
      a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.06 cfm/ft², whichever is greater.
      b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa).
   B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.04 Protection and Cleaning
A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
   B. Cleaning: 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.

END OF SECTION 08 44 13
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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Glazed entrances.
4. Interior borrowed lites.
5. Storefront framing.

B. Related Sections include the following:

1. Division 8 Section “Aluminum Framed Entrances and Storefronts.”

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

   a. Specified Design Wind Loads: As indicated, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
GLAZING 088000 - Page 2 of 10

b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

1) Load Duration: 3 seconds.

c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.

1) For monolithic-glass lites heat treated to resist wind loads.
2) For laminated-glass lites.

b. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
c. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:

a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass and of 12-inch- (300-mm-) long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

1. Each color of tinted float glass
2. For each color (except black) of exposed glazing sealant indicated.

C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

E. Qualification Data: For installers.

F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

G. Warranties: Special warranties specified in this Section.
1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

B. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

C. Glass Product Testing: Obtain glass test results for product test reports in “Submittals” Article from a qualified testing agency based on testing glass products.
   1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in “Submittals” Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
   1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
   2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

E. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
   1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
   5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

F. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired-glass, ANSI Z97.1.
   1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
   2. Lites more than 9 sq. ft. (0.84 sq. m) in area and lites of any area in certain hazardous locations such as sliding glass doors, doors and enclosures for bathtubs, showers, hot tubs, whirlpools, saunas, and steam rooms are required to be Category II materials.
   3. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. (0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section “Project Management and Coordination.”

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer’s written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY

A. General Warranty: 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. Manufacturer’s Special Warranty for Coated-Glass Products: Manufacturer’s standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer’s Special Warranty on Laminated Glass: Manufacturer’s standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

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

2. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS – BASIS OF DESIGN

A. Insulated Glass Units

1. Basis of Design

   Type: Solar Control Low-E Tinted Insulating Glass
   “Solarban®” 60 (2) “Azuria®” + Clear by PPG Industries, Inc.
   Outdoor Lite: “Azuria” Glass by PPG Industries, Inc., Sputter Coated on second surface (2)
   Indoor Lite: Clear Float Glass
   Low-E Coating: “Solarban” 60 Solar Control (Sputtered) by PPG Industries, Inc.
### Location: Second Surface (2)

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<th>U-Value Winter</th>
<th>U-Value Summer</th>
<th>SHGC</th>
<th>Shading Coefficient</th>
<th>Outdoor Visible Light Reflectance</th>
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<td>0.29</td>
<td>0.27</td>
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</tr>
</tbody>
</table>

**Approved Manufacturers:** PPG Certified Fabricator Required  
**Certification:** Both lites to be Cradle to Cradle certified, minimum Silver Level, by Cradle to Cradle Product Innovation Institute (www.c2ccertified.org).  
**Outdoor Appearance:** Aqua-blue color, low-reflective glass product  
**Insulating Unit Construction:** 1/4” (6mm) glass + 1/2” (13mm) air space + 1/4” (6mm) glass

B. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:

1. Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
   - a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.

2. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

#### 2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. EPDM, ASTM C 864.  
2. Silicone, ASTM C 1115.  
3. Thermoplastic polyolefin rubber, ASTM C 1115.  
4. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. EPDM.  
2. Silicone.  
3. Thermoplastic polyolefin rubber.  
4. Any material indicated above.

#### 2.4 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers’ written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer’s full range.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
   a. Available Products:
      1) Dow Corning Corporation; 790.
      2) GE Silicones; SilPruf LM SCS2700.
      3) Tremco; Spectrem 1 (Basic).
   b. Type and Grade: S (single component) and NS (nonsag).
   c. Class: 100/50.
   d. Use Related to Exposure: NT (nontraffic).
   e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
      1) Use O Glazing Substrates: Coated glass; color anodic aluminum; aluminum coated with a high-performance coating; galvanized steel; and wood.

2. Neutral-Curing Silicone Glazing Sealants:
   a. Available Products:
      1) Dow Corning Corporation; 795.
      2) GE Silicones; UltraPruf II SCS2900.
      3) Pecora Corporation; 895.
   b. Type and Grade: S (single component) and NS (nonsag).
   c. Class: 50.
   d. Use Related to Exposure: NT (nontraffic).
   e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
      1) Use O Glazing Substrates: Coated glass; color anodic aluminum; aluminum coated with a high-performance coating; galvanized steel; and wood.

C. Class 25 Neutral-Curing Silicone Glazing Sealant:
   1. Available Products:
      a. Dow Corning Corporation; 799.
      b. GE Silicones; UltraGlaze SSG4000.
      c. Tremco; ProGlaze SG.
   2. Type and Grade: S (single component) and NS (nonsag).
   4. Use Related to Exposure: NT (nontraffic).
   5. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
      a. Use O Glazing Substrates Coated glass; color anodic aluminum; aluminum coated with a high-performance coating; galvanized steel; and wood.

2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

2.8 MONOLITHIC FLOAT-GLASS UNITS

A. Uncoated Clear Float-Glass Units: Class 1 (clear) Kind HS (heat-strengthened) float glass where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with system performance requirements. Provide Kind FT (fully tempered) float glass where indicated or, if not indicated, where required by authorities having jurisdiction.

B. Uncoated Tinted Float-Glass Units: Class 2 (tinted) Kind HS (heat-strengthened) float glass where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with system performance requirements. Provide Kind FT (fully tempered) float glass where indicated or, if not indicated, where required by authorities having jurisdiction.


C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering monolithic float-glass units that may be incorporated into the Work include, but are not limited to, the following:

1. Guardian Industries Corp. (800) 521-9040; www.sun-guardglass.com
2. Pilkington Building Products North America (800) 526-6557; www.pilkington.com
3. PPG Industries, Inc. (800) 377-5267; www.ppgglass.com
4. Oldcastle Glass Group (800) 888-9990; www.oldcastle-glass.com

2.9 LAMINATED-GLASS UNITS

A. Heat-Treated Laminated-Glass Units:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Guardian Industries Corp. (800) 521-9040; www.sun-guardglass.com
   b. Pilkington Building Products North America (800) 526-6557; www.pilkington.com
   c. PPGIndustries,Inc.(800)377-5267;www.ppgglass.com
   d. Oldcastle Glass Group (800) 888-9990; www.oldcastle-glass.com

B. Kind LHS, consisting of two lites of heat-strengthened float glass. Provide Kind LFT (fully tempered) float glass where indicated or, if not indicated, where required by authorities having jurisdiction.

5. Outer Lite: Class 1 clear and Class 2 (tinted) float glass as scheduled.
   a. Tint Color (1): Tint to be selected by Architect, Solarban 60, PPG Solar Control Low-E Glass.
   b. Thickness: 9.0 mm unless otherwise indicated.

6. Inner Lite: Class 1 (clear) float glass.
   a. Thickness: 9.0 mm unless otherwise indicated.

7. Plastic Interlayer:
   a. Thickness: 0.030 inch, but not less than that required to comply as a Type II safety glass material.
   b. Interlayer Color: Clear.
   c. Visible Light Transmittance: 61 percent minimum.

10. Solar Heat Gain Coefficient: Solexia, Solarban 60: 0.36 maximum.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine framing glazing, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep system.
   3. Minimum required face or edge clearances.
   4. Effective sealing between joints of glass-framing members.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL
A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000
SECTION 092116 - GYPSUM BOARD ASSEMBLIES

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. Section includes the following:

   1. Interior gypsum wallboard.
   2. Exterior gypsum board panels for ceilings and soffits.
   3. Tile backing panels.
   5. Impact resistance gypsum wallboard

   B. Related Sections include the following:

   1. Division 5 Section "Cold-Formed Metal Framing" for load-bearing steel framing.
   2. Division 7 Section "Building Insulation" for insulation and vapor retarders installed in gypsum board assemblies.
   3. Division 9 Section "Gypsum Sheathing" for installations over steel framing.

1.3 DEFINITIONS

   A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

   A. Product Data: For each type of product indicated.

   B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work: for walls above allowable heights in accordance with Steel Stud Manufacturers Association. Provide design and show installation details of bracing of walls to structure above, headers, bulkheads, furr downs; and show top-of-wall conditions for walls to deck.

   C. For steel framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

   D. Samples: For the following products:

   1. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.5 QUALITY ASSURANCE

   A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Steel Framing and Furring:
   c. MarinoWare; Division of Ware Ind. 800-627-4661 www.marinoware.com
   d. Unimast Inc. (800) 654-7883 www.unimast.com

2. Gypsum Board and Related Products:
   a. American Gypsum Co. 800-545-6302 www.americangypsum.com
   b. G-P Gypsum Corp. 1-800-284-5347 www.gp.com
   d. United States Gypsum Co. 1-800-874-4968 www.usg.com

2.2 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Components, General: Comply with ASTM C 754 for conditions indicated.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

C. Hangers: As follows:
   1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch (1.37 mm), a minimum 1/2-inch- (12.7-mm-) wide flange, with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.

E. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

F. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   2. USG Interiors, Inc.; Drywall Suspension System.
2.3 STEEL PARTITION AND SOFFIT FRAMING

A. Components, General: As follows:
   1. Comply with ASTM C 754 for conditions indicated.
   2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with
      ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.

B. Steel Runners (Tracks): ASTM C 645, complying with the following requirements for minimum thickness of base
   (uncoated) metal and for depth:
   1. Thicknesses:
      a. Minimum 0.0566 inch (16 gage), in conjunction with .0346 inch (20 gage) studs.
      b. Minimum 0.0346 inch (20 gage), in conjunction with .0188 inch (25 gage) studs.
   2. Depth: As required for studs.

C. Steel Studs (except at doors): ASTM C 645, with flange edges of studs bent back 90 deg and doubled over to
   form 3/16" minimum lip (return) and complying with the following requirements for minimum thickness of base
   (uncoated) metal and for depth:
   1. Thickness: Minimum 0.0188 inch, (25 gage), unless otherwise indicated.
   2. Depth: As indicated.

D. Steel Studs at Doors; Walls Finished with Tile; Wall Mounted Accessories; Supporting abuse- resistant gypsum
   wallboard; And at TV brackets: ASTM C 645, with flange edges of studs bent back 90 deg and doubled over to
   form 3/16" minimum lip (return) and complying with the following requirements for minimum thickness of base
   (uncoated) metal and for depth:
   1. Thickness: Minimum 0.0346 inch, (20 gage), unless otherwise indicated.
   2. Depth: As indicated.

E. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges.

F. Proprietary Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum board applied
   to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to
   accommodate depth of studs.

G. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work
   include, but are not limited to, the following:
   1. Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
   2. Metal-Lite, Inc.; Slotted Track.

H. Proprietary Firestop Track: Top runner manufactured to allow partition heads to expand and contract with
   movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness
   not less than indicated for studs in width to accommodate depth of studs.

PART 1 -

1. Available Product: Subject to compliance with requirements, products that may be incorporated into
   the Work include, but are not limited to, the following:
   a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
   b. Metal-Lite, Inc.; The System.

2.4 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and
   correspond with support system indicated.
B. Gypsum Wallboard: ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated
   1. Type X:
      Thickness: 5/8 inch (15.9 mm).
      Long Edges: Tapered.
   2. Type C: Thickness: 5/8 inch (15.9 mm).
   4. Location: As indicated.

C. Impact Resistant Gypsum Board
   Performance Criteria - Wall Assembly STC: 40
   1. Panel Physical Characteristics
   2. Core: Fire-resistance rated gypsum core, with additives to enhance mold/mildew resistance, surface indentation resistance, impact resistance and moisture and mold resistant
   3. Surface paper: Abrasion resistant, 100 percent recycled content moisture/mold/mildew resistant paper on front, back and long edges
   4. Embedded fiberglass mesh
   5. Long Edges: Tapered
   6. Overall thickness: 5/8 inch
   7. Panel complies with Type X requirements of ASTM C 1396
   8. Surface Abrasion Resistance: Classification Level 3 in accordance with ASTM C 1629
   9. Indentation Resistance: Classification Level 1 in accordance with ASTM C 1629.
   10. Soft Body Impact Resistance: Classification Level 3 in accordance with ASTM C 1629.
   12. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273.

2.5 TILE BACKING PANELS
A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Custom Building Products; Wonderboard Cement Backerboard.
      b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
      c. United States Gypsum Co.; DUROCK Cement Board.
      d. National Gypsum Co.; PermaBase Cement Board.
   2. Thickness: Manufacturer's standard but not less than 7/16 inch, unless otherwise indicated.
      a. Width: Manufacturer's standard width but not less than 32 inches.

2.6 TRIM ACCESSORIES
A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead: Use at outside corners, unless otherwise indicated.
      b. Bullnose Bead: Use where indicated.
      c. LC-Bead (J-Bead): Use at exposed panel edges.
      d. L-Bead: Use where indicated.
      e. U-Bead: Use where indicated.
      f. Expansion (Control) Joint: Use where indicated.
      g. Curved-Edge Cornerbead: With notched or flexible flanges; use at curved openings.
2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.
   1. Joint Tape:
      c. "Tile Backing" Board: Fiberglass Akali Resistant Tape or as otherwise recommended by panel manufacturer.
      d. Water-Resistant Gypsum Backing Board: Use Setting-type Tape.

B. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joint sand damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.
   5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

C. Joint Compound for Tile Backing Panels:
   1. Water-Resistant Gypsum Backing Board: Setting-type, sandable topping compounds.
   2. Tile Backer Board: As recommended by board manufacturer.

2.8 ACOUSTICAL SEALANT

A. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant complying with requirements specified in Division-7 section "Joint Sealers."

2.9 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

D. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

E. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

F. Isolation Strip at Exterior Walls:

G. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

H. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

I. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

2.10 TEXTURE FINISHES

A. Non-Asbestos Powder Finish for Walls and Ceilings: Manufacturer's standard proprietary product formulated with non-asbestos powder for spray application, with surface burning characteristics of 25 per ASTM E 84, and in texture indicated.
   1. Available Products: Subject to compliance with requirements, non-asbestos powder finishes which may be incorporated in the Work include, but are not limited to, the following:
b. ProForm Perfect Spray EM/HF Texture – (Orange Peel Finish); National Gypsum company.

B. Primer: As recommended by textured finish manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination with Sprayed Fire-Resistive Materials:

B. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.

C. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Indicate isolation details on Drawings or insert detailed description here. See "Crack Control" Article in the Evaluations.

D. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.

E. Isolate ceiling assemblies where they abut or are penetrated by building structure.

F. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.

G. Detail headers, control and expansion joints on Drawings.

H. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Suspend ceiling hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.

4. Do not attach hangers to steel deck tabs.

5. Do not attach hangers to steel roof deck. Attach hangers to structural members.

6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member and transversely between parallel members.

C. For exterior soffits, install cross bracing and framing to resist wind uplift.

D. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

E. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.

B. Where studs are installed directly against exterior walls, install asphalt-felt isolation strip between studs and wall.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

D. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.

E. Terminate partition framing at suspended ceilings where indicated.

F. Install steel studs and furring at the following spacings:

1. Single-Layer Construction: 16 inches (406 mm) o.c., unless otherwise indicated.
2. Multilayer Construction: 16 inches (406 mm) o.c., unless otherwise indicated.
3. Cementitious Backer Units: 16 inches o.c., unless otherwise indicated.

G. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

H. Z-Furring Members:

1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches (610 mm) 600 mm o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (600 mm) o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (300 mm) from corner and cut insulation to fit.
I. Install continuous flat steel strapping horizontally over steel studs where panelwork is indicated. Space strapping no more than 28” o.c. vertically. Provide strapping at top and bottom locations of panelwork.

J. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors, and doors over 32” wide. Apply spot grout at each jamb anchor clip prior to inserting board into frame.

3.6 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Form control and expansion joints with space between edges of adjoining gypsum panels.

I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

J. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.

K. Fit gypsum panels around ducts, pipes, and conduits.

L. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

M. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

N. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

O. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

P. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

Q. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.7 PANEL APPLICATION METHODS

A. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

B. Stagger abutting end joints not less than one framing member in alternate courses of board.

C. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

D. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

E. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

F. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

G. Z-Furring Members: Apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

H. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

I. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.

J. Insert specific requirements for particular substrate in paragraph below.

K. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board panels perpendicular to supports, with end joints staggered and located over supports.

L. Fasten with corrosion-resistant screws.

M. Tile Backing Panels:

   1. Cementitious Backer Units: ANSI A108.11. Install at shower walls of steel stud construction indicating tile finish, and install at back and side walls (wet walls) where lavatories, water closets and urinals are installed.

   2. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

   3. Water-Resistant Gypsum Backing Board: Install at remainder of walls (non wet walls) within toilet rooms, in “dry” areas, and where finish schedule indicates. Install with tapered edges taped and finished to produce a flat surface. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

   1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, on portions of walls above ceilings between the ceilings and the tops of walls and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.

   2. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface where panels are substrate for gloss, semi-gloss, or enamel paints; non-textured flat paints; or where severe lighting conditions occur.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.10 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture finish manufacturer's written recommendations.

D. MARKING OF FIRE RATED AND SMOKE STOP PARTITIONS: All rated corridor partitions, smoke stop partitions, horizontal exit enclosures, and fire walls must be permanently marked above ceilings as follows: "FIRE AND SMOKE BARRIER - PROTECT ALL OPENINGS". Letters shall be minimum 2 1/2" in height and painted red. Provide one time per structural bay.

3.11 FIELD QUALITY CONTROL

A. Above Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect shall conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

   1. Notify Architect seven days in advance of date and time when Project, or part of Project, is to be ready for above-ceiling observation.

   2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
   
   3. Installation of 80 percent of lighting fixtures, powered for operation.
   
   4. Installation, insulation, and leak and pressure testing of water piping systems.
   
   5. Installation of air-duct systems.
   
   6. Installation of air devices.
   
   7. Installation of mechanical system control-air tubing.
   
   8. Installation of ceiling support framing.

END OF SECTION 092116
SECTION 09 25 23 – LIME BASED PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Lime Based Plastering

1.2 DEFINITIONS

A. Control Joint: A joint that accommodates movement of shrinkage and curing per ASTM 1063-08.
B. Expansion Joint: A joint that accommodates movement beyond shrinking and curing per ASTM 1063-08.

1.3 REFERENCES

A. ASTM International (ASTM):
   11. D4258 - Standard Practice for Surface Cleaning Concrete for Coating.
   12. D4259 - Standard Practice for Abrading Concrete.
   14. D4261 - Standard Practice for Surface Cleaning Concrete Unit Masonry for Coating.

B. European Committee for Standardization (CEN) EN 1745 - Masonry and Masonry Products; Methods for Determining Design Thermal Values.

1.4 SUBMITTALS
A. Product Data: Manufacturer’s descriptive data, mixing procedures, application instructions, and precautions and limitations in product use.
B. Shop Drawings: Show locations and installation of expansion joints including plans, elevations sections details of components, and attachments to other work.
C. Samples for initial selection:
D. Submit standard color chart.
E. Submit standard texture chart.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 20 years experience in manufacture of specified products.

B. Applicator Qualifications:
   1. Minimum 5 [five] years documented experience in work of this Section.
   2. Successful completion of minimum of 3 [three] projects of similar scope and complexity within past 2 [two] years.
   3. Employ applicators experienced in exterior plaster applications and familiar with specified products.

C. Mock-up:
   1. Apply finish system to minimum 16 [sixteen] square feet of actual substrate.
   2. Show color and surface texture.
   3. Locate where directed.
   4. Approved mockup may not remain as part of the Work.

D. Sample Panels:
   1. Produce three 24 inch square sample panels that are moveable.
   2. Approved sample panels shall be used to judge work.
   3. Approved sample panels shall be distributed:
      a. One to the architect.
      b. One to the contractor.
      c. One to the applicator.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store materials under cover, dry, and protected from temperature extremes and contamination.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Do not apply finishes at temperatures below 40 degrees F or above 95 degrees F.
   2. Ambient temperatures below 40 degrees F: Provide temporary sheet coverings and supplemental heat to prevent freezing of finish.
   3. Protect applied finishes from direct sun, winds above 5 MPH, dust, dirt, frost, and precipitation for 48 hours after application. Provide screening for surfaces by use of small-sized mesh, tarps, or plastic sheeting.
   4. Do not apply finishes during heavy or extended rain or to saturated or frozen surfaces.
1.8 WARRANTY

A. Provide manufacturer’s 20 year performance warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS – BASIS OF DESIGN

A. This section is based on products manufactured by Chaux et Enduits de Saint-Astier and distributed by Southwest Progressive Enterprises, 10920 Alder Circle, Dallas, Texas 75238, 800-780-7731, info@thermocromex.com, www.thermocromex.com.

B. Substitution Limitations: Under provisions of Section 012513.

2.2 MATERIALS

A. Limestone High Performance Cladding:
   1. Source: Thermocromex.
   2. Type: Limestone high performance cladding based on natural hydraulic lime.
   3. Characteristics:
      a. Granulometry: 0.8 to 4.0 mm, tested to ASTM C136.
      b. Compressive strength: 650 PSI average, tested to ASTM C109 at 28 days, 1500 PSI at full cure.
      c. Air Permeance: 0.002 at 75 Pa, tested to ASTM E2178
      d. Flexural strength: 2.0 to 2.5 N/sq mm, tested to ASTM C348 at 28 days.
      e. Water retention: 94 percent plus or minus 2 percent, tested to ASTM C1506 on paste.
      f. Water vapor transmission rate: 84 PERMS, tested to ASTM E96/E96M Wet Cup Method
      g. Wind driven rain resistance: Passed, tested to ASTM D6904 (78 percent better than the standard for weight gain).
      h. Salt fog exposure: No significant change after 300 hours, tested to ASTM B117.
      i. Impact Resistance: Passed 140 Inch-Pound Impact, tested to ASTM D2794
      j. Accelerated weathering; tested to ASTM G154:
         1) Visual color change: None, after 2000 hours.
         2) 60 degree gloss change: 3 gloss units after 2000 hours.
         3) Blistering: None after 2000 hours.
         4) Chalking: None after 2000 hours.
         5) Checking: None after 2000 hours.
         6) Cracking: None after 2000 hours.
         7) Other: None after 2000 hours.
      k. Thermal conductivity: 1.02 square meters-K/W, tested to ASTM C177.
      l. Modulus of Elasticity: 7584 MPa, tested to ASTM C469.
      m. Flame spread/smoke developed: Class A, tested to ASTM E84.
         1) Flame spread/smoke over OSB Substrate: Class A, tested to ASTM E84.
         2) Flame spread/smoke over Lath/Scratch Substrate: Class A, tested to ASTM E84.
         3) Flame spread/smoke over Cementitious Substrate: Class A, tested to ASTM E84.
      n. If applied over a 1 hour approved fire resistant wall assembly Thermocromex being a non-combustible product per ASTM E-136 will not affect in any way that 1 hour fire rated wall assembly.
      o. Volatile organic compound (VOC) content: 0

2.3 MIXES
A. Mix materials in accordance with manufacturer’s instructions using mechanical mixing equipment.

B. Add water to premixed bagged material at rate of 1-1/4 to 1-1/2 gallons per bag until desired consistency is achieved. Use same amount of water per bag for subsequent batches.

C. Add coloring admixture in accordance with manufacturer’s instructions; color to match approved samples.

D. Continue mixing for 6 to 7 minutes total.

E. Clean mixer thoroughly at end of each work day, when work is suspended for an extended period, and when changing colors.

F. Discard mixes not used within 60 minutes after mixing.

G. Source Quality Control:
   1. Perform slump and weight density test on first batch daily and whenever equipment is not in use for more than 30 minutes using materials discharged directly from mixer before application on wall.
   2. Record results of each batch using form provided by manufacturer.
   3. Record location of each batch number on copy of exterior building elevations.
   4. Ensure consistent compliance with manufacturer’s slump and weight density requirements.
   5. Discard batches not complying with slump and density weight requirements and adjust subsequent mixes as required.
   6. If batches fail to meet required slump and weight requirements, remove applied finishes back to last verifiable point at no additional cost to Owner.
   7. Architect may request additional testing at any time during mixing.

2.4 ACCESSORIES

A. Coloring Admixture: ASTM C979, color to be selected from manufacturer’s full color range.

B. Bonding Agent: ASTM C932; Weld-Crete by Larsen Products Corp. (if required).

C. Water: Clean and potable.

D. Lath:
   1. Diamond mesh or rib lath that is self furred, galvanized steel at a minimum 3.4 lb/yd² in compliance with ASTM C847-10a.
   2. Welded wire lath that is self furred, galvanized steel at minimum 1.95lb/yd² in compliance with ASTM C933-1.

E. Expansion Joints: Zinc-coated steel depth equal to finish depth, expanded or perforated flanges, accordion profile with 3/8] inch slot.

PART 3- EXECUTION

3.1 PREPARATION
A. Clean surfaces of loose and foreign matter that could interfere with adhesion of finish, including dust, paint, salts, oils, and organic matter.

B. Concrete Substrates:
1. Clean surfaces using ASTM D4258, D4259, or D4260 methods.
2. Completely remove form oils and bond breakers.
3. On very smooth and non-porous surfaces apply bonding agent in accordance with manufacturer’s instructions or create mechanical key by chiseling or sanding surface.

C. Masonry Substrates:
1. Allow new masonry to cure minimum of 28 days before applying finishes.
3. If vertical head joints are not filled, float joints flush.

D. Sheathing Substrates:
1. As indicated in drawings
2. Ensure that sheathing joints are treated per manufacturer’s recommendations.
3. Install metal lath according to ASTM C1063.

E. Plaster Base Coat Substrates:
1. Ensure plaster base coat conforms to ASTM C926, minimum 1/2 inch thickness, pre-blended only.
2. Achieve the levelness and appearance of a brown coat.
3. Allow new plaster to cure per specific manufacturer’s instructions.

F. One-Coat Stucco Substrates:
1. Ensure stucco has been applied to minimum 1/2 inch thickness.
2. Achieve the levelness and appearance of a brown coat.
3. Allow new plaster to cure per specific manufacturer’s instructions.

G. Dampen surfaces when required to prevent excess suction due to porosity of substrate or climatic conditions. Lightly wet surfaces but do not saturate.

3.2 APPLICATION

A. Apply finish in accordance with manufacturer’s instructions.

B. Apply finish to minimum 1/2 inch thickness. When overall thickness exceeds 3/4 inch, apply second coat 48 hours after first coat. Do not exceed 1-1/2 inch overall thickness. Measure depth using depth gage or equivalent; ensure consistent thickness.

C. Apply finish to [Corbeaux] [Tandour] [Riven] [Seneca] [Flamed] [Durango] [Mojave] [Scoria] [Ashler] [Serpentine] [Sawn] [Vecchia] [Rustic] [Sisal] [Dimension] [Kashmir] [Custom] finish.

D. Finish surfaces true to plane, plumb and with neat, sharp corners and intersections.

E. Work in panels to nearest natural break formed by intersections, corners, trim, and accessories.

F. Expansion Joints: Where required, install expansion joints in finish coat directly over those in substrate; follow requirements of as ASTM C926.
G. Not Acceptable: Lines caused by variations in application or finishing techniques, cold joints, and other surface defects visible when viewed from a distance of 10 feet.

H. Cure applied finishes with light water mist 3 to 4 times daily for 2 to 3 days after application. Prevent uneven and excessive evaporation from surfaces.

I. Installation Tolerance:
   1. Surface tolerance: Maximum 1/8 inch in 10 feet variation from surface flatness.

3.3 FIELD QUALITY CONTROL

A. If current project is applicator’s first application of specified product, manufacturer of finish to provide on-site applicator training for minimum of one day, including review of manufacturer’s application instructions, equipment, application procedures, and curing.

3.4 ADJUSTING

A. Repair or replace damaged, discolored, and defective finishes.

B. Match patched areas to adjacent surfaces.

3.5 CLEANING

A. Remove finish from adjacent and underlying surfaces before it sets.

END OF SECTION
SECTION 092800 - GYPSUM SHEATHING

PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes the following:
   2. Weather-resistant barrier.
B. Related Sections include the following:
   1. Division 7 Section “Sheet Metal Flashing, Trim and Accessories” for flashing installed with gypsum sheathing.
   2. Division 7 Section “Bituminous Dampproofing”.
   3. Division 9 Section “Gypsum Board Assemblies” for steel framing and interior gypsum panels incorporated into assemblies with gypsum sheathing on the exterior.

1.3 DEFINITIONS
A. Gypsum Board Construction Terminology Standard: Refer to ASTM C 11 for definitions of terms for gypsum sheathing board construction not defined in this Section or in other referenced standards.

1.4 SUBMITTALS
A. Product Data: For each type of product indicated.
   1. Installation Accessories (Tapes, precut closure pieces and other items required or recommended by the manufacturer): Manufacturer’s data sheets and complete installation requirements and recommendations.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Store materials protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, or other causes. Stack sheathing flat on leveled supports off the ground, under cover, and fully protected from weather.

1.6 COORDINATION
A. Glass-Mat Gypsum Sheathing Board:
   1. Do not leave exposed to weather for more than 180 days.

PART 2 - PRODUCTS

2.1 GYPSUM SHEATHING
A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, paperless, with glass mat facing on, or embedded into each side of a water-resistant gypsum core.
   1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. "Dens-Glass Gold"; G-P Gypsum Corp. 1-800-284-5347 www gp.com

2. Type and Thickness: Regular, 5/8 inch thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.2 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Glass-Mat Gypsum Sheathing Board:
   1. Cold-Applied, Asphalt Emulsion Dampproofing: Asphalt-based emulsions recommended by the
      manufacturer for dampproofing use when applied according to the manufacturer's instructions.
      a. Trowel applied, long fiber reinforced, complying with ASTM D1227, Type 2, Class I and ASTM
         D1187, Type 1.
   2. Woven glass fabric, treated with asphalt, complying with ASTM D 1668, Type I.
      a. Reinforcement: At changes in plane, perimeter of openings, sheathing joints, or where otherwise
         shown as "reinforced," install lapped course of glass fabric in first coat of dampproofing
         compound before it thickens.

2.3 ACCESSORY MATERIALS

A. Fasteners: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing
   board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance
   of more than 800 hours according to ASTM B 117.
   1. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, attach sheathing with drill screws
      complying with ASTM C 954.

PART 3 - EXECUTION

3.1 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and manufacturer's written instructions.
B. Cut boards at penetrations, edges, and other obstructions of work; fit tightly against abutting construction,
   unless otherwise indicated.
   1. Install boards with a 3/8-inch (9-mm) setback where non-load-bearing construction abuts structural
      elements.
   2. Install boards with a 1/4-inch (6.4-mm) setback where they abut masonry or similar materials that
      might retain moisture, to prevent wicking.
C. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in
   sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.
D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.
E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural
   support elements.
F. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue
   with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of
   boards over centers of stud flanges, and stagger end joints of adjacent boards not less than one stud
   spacing. Screw-attach boards at perimeter and within field of board to each steel stud.
   1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9 mm)
      from edges and ends of boards.
G. Vertical Installation: Install board vertical edges centered over flanges of steel studs. Abut ends and edges
   of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to
   each steel stud.
1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9 mm) from edges and ends of boards.

3.2 SHEATHING JOINT-AND-PENETRATION

A. Seal sheathing joints according to sheathing manufacturer’s written recommendations.

1. Apply woven glass fabric treated with asphalt at changes in plane, perimeter of openings, sheathing joints, or where otherwise shown as “reinforced,” install lapped course of glass fabric in first coat of dampproofing compound before it thickens.

END OF SECTION 092800
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Glazed Wall tile.
2. Stone thresholds installed as part of tile installations.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
2. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
3. Division 9 Section "Gypsum Board Assemblies" for cementitious backer units installed in gypsum wallboard assemblies.

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.
2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.8.

B. Load-Bearing Performance: For ceramic tile installed on walkway surfaces, provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:

1. Moderate: Passes cycles 1 through 10.

1.5 SUBMITTALS

A. Product Data: For each type of tile, mortar, grout, and other products specified.

B. Shop Drawings: For the following:

1. Tile patterns and locations.
2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification: Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.

1. Each type and composition of tile and for each color and texture required, at least 12 inches (300 mm) square, mounted on braced cementitious backer units, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Architect.
2. Full-size units of each type of trim and accessory for each color required.
3. Stone thresholds in 6-inch (150-mm) lengths.
4. Metal edge strips in 6-inch (150-mm) lengths.

D. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

E. Product Certificates: Signed by manufacturers certifying that the products furnished comply with requirements.

F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of architects and owners, and other information specified.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
   1. Stone thresholds.
   2. Joint sealants.

E. Mockups: Before installing tile, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
   1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      a. When directed, demolish and remove mockups from Project site.
      b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.
1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Tile Manufacturers: Refer to specific manufacturers and products indicated in the Drawings to determine the Project requirements. Subject to compliance with requirements, provide products listed in the drawings or equal product by one of the following manufacturers. Acceptance of products other than those listed on the drawings is contingent upon submittal of proposed alternate products to the Architect. Submittal of proposed alternate products must occur prior to bidding as described in Division One specification section “Product Substitutions”. Submittals must demonstrate to the Architect that the proposed alternate product line has colors that match the “Design Basis” listed in the drawings. The Architect may reject the proposed product for technical non-compliance or, at his/her discretion, on the basis of the color match alone.

1. Tile Products:
   a. American Marazzi Tile, Inc.
   b. American Olean; Div. of Dal-Tile International Corp.
   c. Daltile; Div. of Dal-Tile International Inc.
   d. Interceramic.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.


C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. Match colors, textures, and patterns indicated by referencing manufacturer's standard designations for these characteristics.
2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for these kinds of installations and has a record of successful in-service performance.

F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE PRODUCTS

A. Glazed Wall Tile: Provide flat tile complying with the following requirements:
   1. Module Size: 4 by 4 inches unless otherwise indicated.
   2. Thickness: 5/16 inch (8 mm).
   3. Face: Plain with cushion edges.

B. Trim Units: Provide tile trim units to match adjoining tile and to comply with the following requirements:
   1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
   2. Shapes: As follows, selected from manufacturer's standard shapes:
      b. Base for Quarry Tile Installations: Bullnose top w/ Cove base.
      c. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
      d. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above.
      e. External Corners for Thin-Set Mortar Installations: Surface bullnose.
      f. Internal Corners: Field-butted square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.
      g. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide a reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.35 mm) across nominal 4-inch (100-mm) dimension.

2.4 STONE THRESHOLDS

A. General: Provide stone thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
   1. Fabricate thresholds to heights indicated, but not more than 1/2 inch (12.7 mm) above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

2.5 SETTING AND ADHESIVE MATERIALS AND ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide a product by the Tile Manufacturer who supplies tile for the project or by a manufacturer listed below acceptable to the tile manufacturer:
   2. DalTile Corporation; 214-398-1411 www.daltile.com
   3. Laticrete International, Inc. 1 800 243-4788 www.laticrete.com

B. Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A108.1A and as specified below:
   1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15), or polyethylene sheeting ASTM D 4397, 4.0 mils (0.1 mm) thick.
      a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
         1) Mer-Krete Systems, Inc. products manufactured by Merkote Products.
2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches (50.8 by 50.8 mm) by 0.062-inch (1.57-mm) diameter; comply with ASTM A 185 and ASTM A 82, except for minimum wire size.

3. Latex additive (water emulsion) described below, serving as replacement for part or all of gaging water, of type specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate mortar bed.

C. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:
   1. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and liquid-latex additive complying with the following requirements:
      b. For wall applications, provide nonsagging, latex-portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.

D. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, and certified by manufacturer for intended use.

E. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 GROUTING MATERIALS

A. Manufacturers: Subject to compliance with requirements, provide a product by the Tile Manufacturer who supplies tile for the project or by a manufacturer listed below acceptable to the tile manufacturer:
   2. DalTile Corporation; 214-398-1411 www.daltile.com
   3. Laticrete International, Inc. 1 800 243-4788 www.laticrete.com

B. Latex-Portland Cement Grout: ANSI A118.6 for materials described in Section H-2.4, composed as follows:
   1. Mixture of Dry-Grout Mix and Latex Additive: Mixture of factory-prepared, dry-grout mix and latex additive complying with the following requirements:
      a. Dry-Grout Mix: Dry-set grout complying with ANSI A118.6.
         1) Unsanded grout mixture for joints 1/8 inch (3.2 mm) and narrower.
         2) Sanded grout mixture for joints 1/8 inch (3.2 mm) and wider.
      b. Latex Additive: Acrylic resin.

C. Chemical-Resistant Epoxy Grout: ANSI A118.3, color as indicated.
   1. Provide product capable of resisting continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, as certified by mortar manufacturer for intended use.

2.7 ELASTOMERIC SEALANTS

A. General: Provide manufacturer’s standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section “Joint Sealants.”

B. Chemical-Resistant Sealants: For chemical-resistant floors, provide sealants compatible with chemical-resistant mortars and grouts, approved for use indicated by manufacturers of both mortar/grout and sealant and with chemical-resistance properties equivalent to mortar/grout.
C. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

D. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

E. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

F. Products: Subject to compliance with requirements, provide one of the following:

1. One-Part, Mildew-Resistant Silicone Sealants:
   a. Dow Corning 786; Dow Corning Corporation. 800-322-8723
   b. Sanitary 1700; GE Silicones. 866-275-4372 www.gesealants.com
   c. Pecora 898 Sanitary Silicone Sealant; Pecora Corp. 800-664-7903 www.pecora.com
   d. Rhodorsil 6B White; Rhone-Poulenc, Inc.
   e. Tremsil 600 White; Tremco, Inc. 800-852-8173 www.tremcosealants.com

2. Multipart, Pourable Urethane Sealants:
   a. Chem-Calk 550; Bostik. 888-592-8558 www.bostikfindley-us.com
   b. Vulkem 245; Mameco International, Inc. 262-251-1600
   c. NR-200 Urexpan; Pecora Corp. 800-664-7903 www.pecora.com
   d. THC-900; Tremco, Inc. 800-852-8173 www.tremcosealants.com

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: White-zinc-alloy terrazzo strips, 1/8 inch (3.2 mm) wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.

C. Temporary Protective Coating: Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products; and is easily removable after grouting is completed without damaging grout or tile.

D. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.

E. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

F. Grout Sealer: Manufacturer’s standard product for sealing grout joints that does not change color or appearance of grout.

1. Available Products:
   b. Bostik; CeramaSeal Grout Sealer.
   c. C-Cure; Penetrating Sealer 978.
   e. Jamo Inc.; Sealer.
   f. MAPEI Corporation; KER 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
   g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
   i. TEC Specialty Products Inc.; TA-257 Silicone Grout Sealer.
2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers’ written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.

2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

B. Provide concrete substrates for tile floors installed with latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.

1. Use trowelable leveling and patching compounds per tile-setting material manufacturer’s written instructions to fill cracks, holes, and depressions.

2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:

1. Petroleum paraffin wax, applied hot.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in “Specifications for Installation of Ceramic Tile” that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Provide sealant at interior corners of floor-to-wall, wall-to-wall, and wall-to-ceiling joints.

H. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated, during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

I. Locate joints in tile surfaces directly above joints in concrete substrates; where substrate materials change; and where floor tile abuts restraining surfaces such as perimeter walls, curbs and columns. Locate joints in field tile at maximum 24'-0" o.c. each way. Install control joints in accordance with current TCA Method EJ171. Provide bullnosed or eased-edge tiles at expansion joints, control joints, and other sealant-filled joints, and where otherwise indicated.

1. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

J. Grout tile to comply with the requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.
2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

3.4 WALL TILE INSTALLATION METHODS

A. Install types of tile designated for wall application to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

   a. Metal Studs, Interior: TCA W243 (at dry conditions only)
   b. Metal Studs, Interior: TCA B412 (at wet conditions, over cementitious backer)
   c. Metal Studs, Interior: TCA B413 (at wet conditions, over water resistant gypsum board)
   d. Concrete Masonry Units, Interior: TCA W202


3.5 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.6 SCHEDULE

A. Reference drawings for colors and patterns.

END OF SECTION 093013
SECTION 09511 - ACOUSTICAL PANEL CEILINGS

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 ceilings consisting of acoustical panels and exposed suspension systems.

1.3 SUBMITTALS
A. Product Data: For each type of product specified.
B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
   1. Ceiling suspension system members.
   2. Method of attaching suspension system hangers to building structure.
   3. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
C. Samples for Verification: Full-size units of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
   1. 6-inch- (150-mm-) square samples of each acoustical panel type, pattern, and color.
   2. Set of 12-inch- (300-mm-) long samples of exposed suspension system members, including moldings, for each color and system type required.
D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
E. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.
F. Research/Evaluation Reports: Evidence of acoustical panel ceiling's and components’ compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
G. Certification: Provide certification from manufacturer of products that all materials used in food preparation and food serving areas have USDA approval for use in food preparation and food serving areas.

1.4 QUALITY ASSURANCE
A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
B. Source Limitations for Ceiling Units: Obtain each acoustical ceiling panel from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
C. Source Limitations for Suspension System: Obtain each suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
   1. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
a. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.

b. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.

D. Certify all materials used in food preparation and food serving areas have USDA approval for use in food serving and food preparation areas.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section “Project Meetings.”

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed.

2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 – PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing ASTM E 1264 pattern designations and not manufacturers’ proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
2.2 MINERAL-BASE PANELS - WATER FELTED

A. Type, Form, and Finish: Provide type III, Form 2 units per ASTM E 1264 with painted finish that comply with pattern and other requirements indicated.

B. Perforated and Fissured Pattern: Units matching pattern indicated by reference to manufacturers’ standard pattern designations, with other characteristics as follows.

   1. Color/Light Reflectance Coefficient: White/LR 0.80.
   2. Noise Reduction Coefficient: NRC 0.55.
   4. Edge Detail: Square.
   5. Size: 24 inches by 24 inches by 5/8 inch and 24 inches by 48 inches by 5/8 inch as indicated on drawings.

2.3 VINYL FACED ACOUSTICAL CEILING PANELS

A. Type, Form, and Finish: Provide Per ASTM E 1264 with finish that comply with pattern and other requirements indicated.

   a. Square edge
   b. 2'x2'x1/2”
   c. Color/Light Reflectance Coefficient: White/LR 0.77

2.4 GYPSUM BOARD PANELS – VINYL FACED

A. Type: Provide Type XX units per ASTM E 1264 that are resistant to heat, moisture, and corrosive fumes and that comply with pattern and other requirements indicated.

B. Smooth Pattern: Units matching pattern indicated by reference to manufacturers’ standard pattern designations, with other characteristics as follows:

   1. Color/Light Reflectance Coefficient: White/LR 0.75.
   3. Edge Detail: Square.
   4. Size: 24 inches by 48 inches by 1/2 inch.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Grid Members:

   1. Minimum 0.015-inch bare metal thickness.
   2. Minimum 300 lb. tension/ compression connection value.
   3. UL- certified for load compliance as required by ASTM C635.

D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.

   1. Postinstalled Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

F. Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from extruded aluminum, or sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

2.6 CUSTOM PERIMETER TRIM

A. Product/Manufacturer: Axiom-Classic Custom Perimeter Trim; Armstrong World Industries, Inc.

B. Components: Edge trim system for suspended ceiling system, extruded aluminum alloy 6063 trim channel, 10 foot straight or curved profiles to minimum (24 inches for 2 through 8 inch high) (36 inch for 10 and 12 inch high) inside and outside radii for acoustical and for drywall applications.

1. Axiom Trim Channel: 4" wide face with 3/4 inch horizontal legs, straight or curved sections with special bosses formed for attachment to the Axiom tee-bar connection clip or hanging clip; commercial quality, extruded aluminum, factory-finished in (factory-applied baked polyester paint to match Armstrong) ( ) color; (architectural film textured finish); (custom paint finish color-matched to approved sample).

2. Axiom Outside Corner Posts (Straight Only): Commercial quality extruded aluminum sections formed to match the Axiom trim channel profile; pre-assembled with built-in splice plates that connect to straight Axiom sections; 7/8 inch x 7/8 inch x 4"; factory-finished in (factory-applied baked polyester paint to match Armstrong) ( ) color; (architectural film textured finish); (custom paint finish color-matched to approved sample).

   a. AX4OSCP – 4" Axiom Classic Outside Corner Post

3. Axiom Inside Corners (Straight Only): Commercial quality extruded aluminum sections formed to match the Axiom trim channel profile that connect to straight Axiom sections, 12 inch x 3/4 inch x 4" factory-finished in (factory-applied baked polyester paint to match Armstrong) ( ) color; (architectural film textured finish); (custom paint finish color-matched to approved sample).

   a. AX4QIS – 4" inside corner

4. Accessories:
   a. AXHGC – Hanging clip, commercial quality aluminum, unfinished, used to align grid members that extend beyond the lower edge of the trim.
   b. AX2HGC – Hanging clip, commercial quality aluminum, unfinished, used when suspension wires must be attached directly to the trim sections.
   c. AXSPsplice – Splice with set screws, galvanized steel, unfinished, used to attached factory-mitered inside corners
   d. AX4SPsplice – Splice with set screws, galvanized steel, unfinished, used to attach joints between sections of trim.
   e. AXTBC – T-bar Connector Clip, galvanized steel, unfinished, used to attach channel trim to supporting suspension members.
   f. AXSPTHDC – Perimeter Trim Hold Down Clip used to secure cut edges of metal panels at the Axiom trim.
   g. AXBSTR – Drywall Bottom Trim Straight, extruded aluminum, 120 inches x 1-9/64 inch x 27/32 inch, used to finish edges of 5/8 inch drywall that is applied to the bottom surface of the Axiom.

5. Installation Hardware (included in Kit):
   a. Axiom Splices and connection clips
2.7 NON-FIRE-RESISTANCE-RATED DIRECT-HUNG SUSPENSION SYSTEMS

A. Wide-Face Double-Web Steel Suspension System: Main and cross-runners roll-formed from prepainted or electrolytic zinc-coated cold-rolled steel sheet, with prepainted 15/16-inch-wide flanges; other characteristics as follows:

2. Finish: Painted, white.

2.8 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated for each designation:


2. Gypsum Board Panels – Vinyl faced, Non-Fire-Resistance Rated (APC2):
   b. “‘Sheetrock’ Lay-In Ceiling Tile, ‘ClimaPlus’, Vinyl”, USG Interiors, Inc.

3. Non-Fire-Resistance-Rated Wide-Face Double-Web Steel Suspension Systems:
   a. Armstrong World Industries, Inc.
   b. CertainTeed Ceilings.
   c. USG Interiors, Inc.

4. Edge Moldings:
   a. Armstrong World Industries, Inc.
   b. CertainTeed Ceilings.
   c. USG Interiors, Inc.

5. Custom Perimeter Trim:
   a. Armstrong World Industries, Inc.
   b. USG Interiors, Inc.

2.9 ACOUSTICAL SEALANT

A. Acoustical Sealant for Concealed Joints: Manufacturer’s standard nondrying, nonhardening, nonskinnning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."


B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
F. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

   1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
   2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   3. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
   4. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
   5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.
   6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Extent and Testing Frequency: Testing will take place in successive stages in areas described below. Proceed with installation of acoustical panel ceilings only after test results for previously installed hangers comply with requirements.

   1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
   2. Within each test area, testing agency will select one of every 10 powder-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
   3. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 consecutively pass and then will resume initial testing frequency.
   4. Testing agency will report test results promptly and in writing to Contractor and Architect.
   5. Remove and replace those fasteners and anchors that test results indicate do not comply with specified requirements.

C. Additional Testing: Where fasteners and anchors are removed and replaced, additional testing will be performed to determine compliance with specified requirements.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511
SECTION 096513 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes the following:
      1. Resilient wall base.
      2. Resilient flooring accessories.
      3. Resilient carpet accessories.
   B. Related Sections include the following:
      1. Division 9 Section "Resilient Floor Tile."
      2. Division 9 Section "Sheet Vinyl Floor Coverings."

1.3 SUBMITTALS
   A. Product Data: For each type of product specified.
   B. Samples for Verification: In manufacturer's standard sizes, but not less than 12 inches (300 mm) long, of each product color and pattern specified.
   C. Product Certificates: Signed by manufacturers of resilient wall base and accessories certifying that each product furnished complies with requirements.

1.4 QUALITY ASSURANCE
   A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.
   B. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
   C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
      1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.
      2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
   B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).
   C. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.
1.6 PROJECT CONDITIONS

A. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive resilient products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

B. Do not install products until they are at the same temperature as the space where they are to be installed.

C. Coordinate resilient product installation with other construction to minimize possibility of damage and soiling during remainder of construction period. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for each 500 linear feet (150 linear m) or fraction thereof, of each different type, color, pattern, and size of resilient product installed.

B. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Rubber Wall Base: Products complying with ASTM F1861-00, Type TS or Type TP, as indicated by manufacturer listed in the color schedule, and with requirements specified in the Resilient Wall Base and Accessory Schedule. When the manufacturer listed in the color schedule produces a “Type TS” base, only manufacturers listed on the “Type TS” list of manufacturers may have their products bid for the project. When the manufacturer listed in the color schedule produces a “Type TP” base but not a “Type TS” base, the manufacturers listed on the “Type TS” and “Type TP” lists of manufacturers may both have their products bid for the project.

1. Products:

a. Color and Pattern: As indicated.
b. Style: Cove with top-set toe.
c. Minimum Thickness: 1/8 inch (3.2 mm).
d. Height: 4 inches (101.6 mm).
e. Lengths: Coils in lengths standard with manufacturer, but not less than 96 feet (29.26 m).
f. “Type TP”:

   1) Rubber Cove Base, Armstrong World Industries, Inc. 877-276-7876 www.armstrong.com
   2) Rubberrmyte, Burke Flooring 800-447-8442 www.burkeflooring.com
   4) Rubber Cove Base, Johnsonite 800-899-8916 www.johnsonite.com

2. Outside Corners: Premolded or formed on job.
3. Inside Corners: Premolded or formed on job.
4. Ends: Premolded.
5. Surface: Smooth.

B. Rubber Accessory Molding: Provide rubber accessory molding complying with the following:

1. Reducer strip for resilient flooring to concrete, quarry tile, or resilient wood flooring system.

   a. Profile and Dimensions: As specified by product designation below.
   b. Color: As selected by Architect from manufacturer’s full range of colors produced for rubber accessories complying with requirements indicated.
   a. Profile and Dimensions: As specified by product designation below.
   b. Color: As selected by Architect from manufacturer's full range of colors produced for rubber
      accessories complying with requirements indicated.
   c. Products: #38 Glue Down Carpet Edge, Roppe Corporation, U.S.A. 800-537-9527

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided
   or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate
   conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer
   present, for compliance with manufacturer's requirements, including those for maximum moisture content.
   Verify that substrates and conditions are satisfactory for resilient product installation and comply with
   requirements specified. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with manufacturer's written installation instructions for preparing substrates indicated to
   receive resilient products.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks,
   holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and
   that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use
   solvents.

D. Broom and vacuum clean substrates to be covered immediately before installing resilient products. After
   cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation
   until unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. General: Install resilient products according to manufacturer's written installation instructions.

B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other
   permanent fixtures in rooms and areas where base is required.

1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces
   aligned.
2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with
   horizontal and vertical substrates.
3. Do not stretch base during installation.
4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base
   with manufacturer's recommended adhesive filler material.
5. Form outside corners on job, from straight pieces of maximum lengths possible, without whitening at
   bends. Shave back of base at points where bends occur and remove strips perpendicular to length of
   base that are only deep enough to produce a snug fit without removing more than half the wall base
   thickness.
6. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

C. Place resilient products so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

D. Apply resilient products to stairs as indicated and according to manufacturer's written installation instructions.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing resilient products:

1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
2. Sweep or vacuum horizontal surfaces thoroughly.
3. Do not wash resilient products until after time period recommended by resilient product manufacture.
4. Damp-mop or sponge resilient products to remove marks and soil.

B. Protect resilient products against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by resilient product manufacturer.

1. Cover resilient products installed on floors and stairs with undyed, untreated building paper until inspection for Substantial Completion.

C. Clean resilient products not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.

END OF SECTION 096513
PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes the following:
      1. Vinyl composition tile (VCT).
   B. Related Sections include the following:
      1. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base, reducer strips, and other accessories installed with resilient floor tile.

1.3 SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.
   C. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 QUALITY ASSURANCE
   A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS
   A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:
      1. 48 hours before installation.
      2. During installation.
      3. 48 hours after installation.
   B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
   C. Close spaces to traffic during floor covering installation.
   D. Close spaces to traffic for 48 hours after floor covering installation.
   E. Install resilient products after other finishing operations, including painting, have been completed.
1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

A. Colors and Patterns: As indicated by manufacturer's designations in the Color Schedule on the Drawings.

2.3 VINYL COMPOSITION TILE

A. Vinyl Composition Tile (VCT): ASTM F 1066.

   1. Armstrong Standard Excelon, Imperial Texture, 12” x 12” x 1/8”.
   2. Azrock, 12” x 12’ x 1/8”.
   3. Mannington 12” x 12” x 1/8”.

B. Class: 2 (through-pattern tile), unless otherwise indicated.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch (3.2 mm).

E. Size: 12 by 12 inches (305 by 305 mm).

F. Fire-Test-Response Characteristics:

   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   3. Moisture Testing:
      a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
      b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
   1. Do not install resilient products until they are same temperature as space where they are to be installed.

G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles square with room axis, unless otherwise indicated.

B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
   1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern) in pattern of colors and sizes indicated.

C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

D. Extend tiles into toe spaces, door reveals, closets, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.
   a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
2. Use commercially available product acceptable to manufacturer. Coordinate selection of floor polish with Owner’s maintenance service.
3. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
4. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 096519
SECTION 096816 - CARPET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Tufted carpet.

B. Related Sections include the following:
   1. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.

B. Shop Drawings: Show the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
   2. Carpet type, color, and dye lot.
   3. Locations where dye lot changes occur.
   4. Seam locations, types, and methods.
   5. Type of subfloor.
   6. Type of installation.
   7. Pattern type, repeat size, location, direction, and starting point.
   8. Pile direction.
   9. Type, color, and location of insets and borders.
   10. Type, color, and location of edge, transition, and other accessory strips.
   11. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet: 12-inch- (300-mm-) square Sample.
   2. Exposed Edge Stripping and Accessory: 12-inch- (300-mm-) long Samples.
   3. Carpet Seam: 6-inch (150-mm) Sample.
   4. Mitered Carpet Border Seam: 12-inch- (300-mm-) square Sample. Show carpet pattern alignment.

D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

E. Maintenance Data: For carpet to include in maintenance manuals specified in Division 1. Include the following:
   1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 0 Section "Substitutions."

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.7 WARRANTY

A. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

1. Warranty Period
   i. Wear Warranty: 15 Year Limited Wear Warranty
   ii. Backing Warranty: 15 Year Limited Backing Warranty
   iii. Bleach Resistance Warranty: 15 Year Limited ColorSafe Warranty
   iv. Stain Resistance Warranty: 15 Year Limited XGUARD Warranty
   v. Bond Warrany: 10 Year Limited Warranty

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

PART 2 - PRODUCTS

2.1 TUFTED CARPET, NON-PADDED, CPT

A. Products: Carpet shall be high-density commercial carpet. Provide a minimum of 16 colors as approved by the owner. Carpet shall be standard manufacturer's product available in small quantities from local dealers. No special or end run colors shall be accepted. Subject to compliance with these and other requirements, provide the following:

1. Lees:
   a. Faculty IV, 12' Broadloom and Modular.

2. Mannington:
   a. Intuition III 24 oz, 12' Broadloom and Modular.
   b. Motivation III 24 oz, 12' Broadloom and Modular.
   c. Everywhere Plus 26oz, 12' Broadloom and Modular.
   d. Great Facilities 26 oz, 12' Broadloom and Modular.
3. Shaw:
   a. Reflections IV
   b. Ecoworx Performance Broadloom EWPB
   c. Reflections IV, Modular

4. Color and Pattern:
   a. As selected by Architect.


C. Face Fiber: Shall be branded fiber, Invista Antron Type 6.6 Legacy or Lumena. No substitutions will be accepted.

D. Yarn weight: 24 ounces per square yard, minimum.

E. Gauge: 1/10” min.

F. Stitches: 8.0 stitches per inch min.

G. Pile Height: .134” min. for finished carpet per ASTM D 418.

H. Primary Backing: Woven polypropylene.

I. Secondary Backing:
   a. Lees, “Unibond Flex” or “Unibond Flex Bloc”.
   b. Shaw, “Ecoworx” or “Ultraloc Pattern”.
   c. Mannington “Integra HP”.
   d. No substitutions will be accepted.

J. Flammability: Must pass flammability standards for both face and backing (Department of Commerce Test #FF 1-70.) Pill Test.

K. Composition: Carpet shall be free of asbestos.

L. Tuft Bind: Minimum 20 # per ASTM A133567 UM 44C for the life of the carpet wet or dry.

M. Product Guarantee: Product to be guaranteed not to delaminate or no edge ravel for the lifetime of the carpet. Chair pads are not required.

N. Wear Guarantee: No more than 10% face yarn loss by weight under normal use for the lifetime of the carpet.

O. Carpet shall be impervious to water damage.

P. Static Control: 3.0 KV at 70 degrees, 20% R.H. when tested under the Standard Shuffle Test.

Q. Performance Characteristics: As follows:
   1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
   2. Dry Breaking Strength: Not less than 100 lbf (445 N) per ASTM D 2646.
   3. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC-165.
   4. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC-16.
   5. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC-174.

2.2 CARPET – PADDED

A. Padded carpet shall meet or exceed requirements of non-padded carpet specifications plus shall comply with the following:
   1. Padding shall be factory installed “Powerbond” or approved equal, meeting the following minimum requirements:
a. Backing shall meet ASTM 1667-70; Sealant Vinyl; closed cell vinyl cushion, weight 35.5 oz/sq. yd.;
density 18.5 lbs/cu. ft; thickness .156; compression set 10% maximum; compression deflection 7
lbs./sq. in. at 25%.

2.1 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation
provided by or recommended by the following:
   1. Carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions
indicated, that complies with flammability requirements for installed carpet and that is recommended by the
following:
   1. Carpet manufacturer.

C. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for
taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed
edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content,
alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that
substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that
      may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing
      bond and moisture tests recommended by the following:
         a. Carpet manufacturer.
   2. Subfloor finishes comply with requirements specified in Division 3 Section “Cast-in-Place Concrete” for
      slabs receiving carpet.
   3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. For wood subfloors, verify the following:
   1. Underlayment over subfloor complies with requirements specified in Division 6 Section “Rough
      Carpentry.”
   2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or
      show through surface.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, “Site Conditions; Floor Preparation,” and carpet manufacturer's
written installation instructions for preparing substrates indicated to receive carpet installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill
cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives
and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended
in writing by the following:
   1. Carpet manufacturer.
D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Direct-Glue-Down Installation: Comply with CRI 104, Section 8, "Direct Glue-Down Installation."

B. Carpet with Preapplied Adhesive Installation: Comply with CRI 104, Section 10.4, "Pre-Applied Adhesive Systems (Peel and Stick)."

C. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
   1. Level adjoining border edges.

D. Do not bridge building expansion joints with carpet.

E. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Blind or seal cut edges as recommended by carpet manufacturer.

F. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
   2. Remove yarns that protrude from carpet surface.

B. Protect installed carpet to comply with CRI 104, Section 15, "Protection of Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION 096816
SECTION 09 77 00 - FRP WALL PANELS

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes the following types of FRP wall panels:
      1. FRP prelaminated wall panels.

1.3 SUBMITTALS
   A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
   B. Product data including installation methods for each different type of substrate. Provide written data including physical characteristics, such as durability, resistance to fading, and flame resistance. Include the manufacturer’s recommendations for maximum permissible moisture content of substrates.
   C. Shop drawings showing location, extent, and installation details. Include indication of wall panel termination points. Provide elevations showing nonstandard conditions.
      Samples for Initial Selection: For initial selection of color, pattern and surface texture, provide the manufacturer's standard color chips consisting of actual sections of each FRP wall panel and vinyl plastic material required showing the full range of materials, colors, and textures available.
      Samples for Verification Purposes: Provide the following samples for verification of compliance with requirements indicated. Prepare samples from the same material to be used in the Work.
      1. 6 inch by 6 inch square samples of each wall panel material required for verification of color, pattern, and texture selected.
      2. 12 inch long sample of each molding accessory.
   D. Product test reports from a qualified independent testing laboratory showing compliance of FRP wall panel materials with requirements indicated based on tests performed by the laboratory within the past five years.

1.4 QUALITY ASSURANCE
   A. Installer Qualifications: Engage an experienced Installer who has previously installed FRP wall panel materials similar in design and extent to the materials required on this Project.
   B. Fire Performance Characteristics: Provide FRP wall panels that are identical to those tested in accordance with ASTM E 84 for the fire performance characteristics indicated below. Identify wall panel materials with appropriate markings from the testing and inspection organization.
      1. Flame Spread: 25 or less.
      2. Smoke Developed: 450 or less.
   C. Single Source Responsibility: Obtain each color, texture, grade, finish, and type of FRP wall panel material from a single source with resources to provided products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.5 DELIVERY, STORAGE AND HANDLING
A. Store materials inside in original undamaged packages in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Do not store rolled goods upright; lay flat, blocked off the ground to prevent sagging and warping.

1. Maintain room temperature within the storage area at not less than 70 deg F (21 deg C) during the period FRP wall panel and accessory materials are stored. Keep material out of direct sunlight to avoid surface distortion.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Do not install FRP wall panel material until the space to receive the wall panel material is enclosed and weatherproof. Do not install materials until the ambient temperature within the building is maintained and stabilized at not less than 70 deg F (21 deg C) for not less than 72 hours prior to beginning of the installation.

1.7 SEQUENCING AND SCHEDULING

A. Schedule installation with other construction activities to minimize the possibility of damage and soiling during the remainder of the construction period.

1.8 MAINTENANCE

A. Maintenance Instructions: Provide the manufacturer's instructions for maintenance of installed work. Include recommended methods and frequency for maintaining materials in optimum condition under anticipated traffic and use conditions. Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Basis-of-Design: Subject to compliance with requirements, provide Fire-X Glasbord, Crane Composites, Inc. A Crane Co. Company 800-435-0080 www.cranecomposites.com or a comparable product by the following, or the listed product:

   NCP fiber-lite, Nudo Product, Inc. (818) 530-8008 www.nudo.com

2.2 FRP WALL PANELS

A. Wall Panels: Provide manufacturer's standard, FRP wall panels. Panels shall consist of 0.09 inch thick, textured, USDA approved, panel.

   1. Sheet Size: 4 by 9 feet.

B. Colors and Textures of Plastic Material: Provide plastic material that matches color and texture indicated by reference to the manufacturer's standard color and texture designation.

C. Adhesive: Provide the type of adhesive recommended by the manufacturer for use with the wall panel material on the substrate indicated.

D. Trim: Provide extruded, impact-resistant, vinyl plastic trim members matching color of wall panel materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates scheduled to receive FRP wall panel materials for compliance with manufacturer's requirements and conditions affecting performance.
3.2 PREPARATION

A. General: Prior to installation clean substrate to remove dust, debris, and loose particles. Provide skim coat over rough walls to smooth surface.

1. Complete all finishing operations, including painting, before beginning installation of FRP wall panel materials.
2. Test masonry and plaster substrates to receive FRP wall panel with an electronic moisture meter. Moisture content shall be within manufacturer's recommended limits.
3. Prime and seal substrates, if required, in accordance with the FRP wall panel material manufacturer's recommendations for the type of substrate.

3.3 INSTALLATION

A. General: Install FRP wall panel materials in accordance with manufacturer's recommendations using adhesive recommended for use over the substrate.

1. Moldings: Furnish moldings for perimeter edging where indicated. Install moldings in the longest practical lengths. Tightly butt end joints and miter corners.
2. Installation Type: full-wall height, from top of wall base to 8 inches above ceiling.

3.4 CLEANING

A. General: Immediately upon completion of installation, clean FRP wall panels and accessories using a manufacturer's recommended cleaning agent. Clean moldings in accordance with the manufacturer's recommendations.

B. Remove excess adhesive, using methods and materials recommended by manufacturer.

C. Remove surplus materials, rubbish, and debris resulting from installation upon completion of Work, and leave areas of installation in neat, clean condition.
SECTION 09 77 23 - ACOUSTICAL WALL PANELS

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Extent of acoustical wall panels is shown on drawings.

1.3 SUBMITTALS
   A. Product Data: Submit manufacturer’s technical data for each type of acoustical wall panel required.
   B. Samples for Initial Selection Purposes: Submit manufacturer’s standard size swatches of material indicated as facing for acoustical wall panels showing full range of colors, textures, and patterns available for each type of panel and facing material required.
   C. Samples for Verification Purposes: Submit 12 inch square samples of each type of acoustical wall panel required and in each color, texture and pattern indicated or selected for facing materials. Include representative samples of installation devices and accessories.
   D. Certified Test Reports: Submit test data from an independent testing agency, acceptable to authorities having jurisdiction, evidencing that panel assemblies comply with requirements indicated for fire performance characteristics.
   E. Certificates: Submit certificates from manufacturers of acoustical wall panels attesting that their products comply with specified requirements including those for fire performance characteristics.

1.4 QUALITY ASSURANCE
   A. Fire Performance Characteristics: Provide acoustical wall panels, with surface-burning characteristics as indicated below, which have been determined by testing assemblies of identical materials and construction according to ASTM E 84 by a testing organization acceptable to authorities having jurisdiction.
      1. Flame Spread: 25 or less.
      2. Smoke Developed: 450 or less.

1.5 PRODUCT HANDLING
   A. Protect acoustical wall panels from excessive moisture in shipment, storage, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until “wet work” such as concrete and plaster have been completed and cured to a condition of equilibrium.

1.6 PROJECT CONDITIONS
   A. Do not begin installation until spaces to receive acoustical wall panels have been enclosed and maintained at approximately the same humidity and temperature conditions as planned for occupancy. Maintain temperature and humidity as recommended by panel manufacturer.

1.7 EXTRA MATERIALS
   A. Deliver extra materials to Owner. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels:
      1. Acoustical Wall Panels: Furnish quantity of full size units equal to 2.0 percent of the amount installed.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include the following:

4. AVL Systems, Inc. 800-228-7842 www.avlonline.com
5. CertainTeed Corporation 800-233-8990 www.certainteed.com
6. Conwed Designscape 800-932-2383 www.conweddesignscape.com
8. Golterman & Sabo 800-737-0307 www.golterman.com
9. Interior Acoustics, Inc. 800-221-0580
11. Lamvin, Inc. 800-446-6329 www.lamvin.com
13. Peabody/Hard Side
15. Vicraacoustics
16. Wall Technology, Inc. 800-359-3312 www.walltechnology.com
17. Woodard Contract, Inc.
18. Sound Concepts Canada Inc. 204-783-6297 www.soundconceptscan.com

2.2 ACOUSTICAL WALL PANELS, GENERAL

A. Fabricate panels to sizes and configurations indicated; attach facing materials to cores to produce installed panels with visible surfaces fully covered and free from wrinkles, sags, blisters, seams, adhesive or other foreign matter.

1. Fabricate back-mounted panels in factory to exact sizes required to fit wall surfaces based on field measurements of completed substrates indicated to receive wall panels.

B. Sound Absorption Performance: Provide acoustical wall panels with minimum noise reduction coefficients (NRC) indicated as determined by testing per ASTM C 423 for mounting type specified under individual product requirements.

C. Colors, Textures and Patterns: Where manufacturer's standard material is indicated, provide acoustical wall panels faced with manufacturer's material complying with the following requirements:

1. Provide color, texture and pattern to match that indicated by reference by manufacturers' standard designation for these characteristics.

2.3 BACK-MOUNTED ACOUSTICAL WALL PANELS

A. Impact Resistance: Provide impact resistant panel facings for panels indicated to be installed at a height of 9'-0" above finish floor and less.

B. Back-Mounted Edged-Reinforced Acoustical Wall Panels with Impact-Resistant Face: Provide manufacturers standard panel construction consisting of facing material laminated to front, edges and back border of 2-ply molded glass fiber board core, with edges chemically hardened to reinforce panel perimeter against warpage and damage, and complying with the following requirements:

1. Thickness/Core Density: 1 inch / 7 lbs. per cu. ft.
   a. Octave Band Center Frequencies (Hz)/Nominal Absorption Coefficient: Panels shall have the following nominal octave band absorption coefficients within a tolerance of plus or minus 5% when mounted directly on a hard surface:
      1.) 125/0.21
      2.) 250/0.53
      3.) 500/0.97
C. STRUCTURAL FRAMING USING WOOD, PLASTIC, OR METAL WILL NOT BE ACCEPTED!

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level, and in alignment with other panels, scribed to fit adjoining work accurately at borders and at penetrations. Comply with panel manufacturer's printed instructions for installation of panels using type of mounting accessories indicated or, if none indicated, as recommended by manufacturer.

B. Remove and replace panels which are damaged and are unacceptable to Architect.

END OF SECTION 09 77 23
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 surface preparation and field painting of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint all exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:
   a. Architectural woodwork.
   b. Acoustical wall panels.
   c. Metal toilet enclosures.
   d. Metal lockers.
   e. Finished mechanical and electrical equipment.
   f. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
   a. Foundation spaces.
   b. Furred areas.
   c. Ceiling plenums.
   d. Utility tunnels.
   e. Pipe spaces.
   f. Duct shafts.
   g. Elevator shafts.

3. Finished metal surfaces include the following:
   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper and copper alloys.
   e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:
   a. Valve and damper operators.
   b. Linkages.
   c. Sensing devices.
   d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

6. DO NOT APPLY OIL-BASED PRODUCTS TO INTERIOR SURFACES OF EXTERIOR WALLS. PROVIDE WATER-BASED PRODUCTS ONLY AT THESE LOCATIONS. COORDINATE APPLICATIONS WITH ARCHITECT.

D. Related Sections include the following:

1. Division 2 Section "Pavement Marking" for traffic-marking paint.
2. Division 5 Section "Structural Steel" for shop priming structural steel.
3. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
4. Division 8 Section "Steel Doors and Frames" for factory priming steel doors and frames.
5. Division 9 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

1. Material List:
   a. An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer’s catalog number and general classification.

2. Manufacturer’s Information:
   a. Manufacturer’s technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit two Samples on the following substrates for Architect’s review of color and texture only:
   a. Concrete: 4-inch- (100-mm-) square Samples for each color and finish.
   b. Concrete Unit Masonry: 4-by-8-inch (100-by-200-mm) Samples of masonry, with mortar joint in the center, for each finish and color.
   c. Painted Wood: 12-inch- (300-mm-) square Samples for each color and material on hardboard.
   d. Stained or Natural Wood: 4-by-8-inch (100-by-200-mm) Samples of natural- or stained-wood finish on representative surfaces.

C. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE
A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
   a. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m).
   b. Small Areas and Items: Architect will designate items or areas required.

2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
   a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.

3. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
   1. Product name or title of material.
   2. Product description (generic classification or binder type).
   3. Manufacturer's stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.
   8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.

   1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS
A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish Owner with an additional 3 percent, but not less than 1 gal. (3.8 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

B. Manufacturers’ Names: Shortened versions (shown in parentheses) of the following manufacturers’ names are used in other Part 2 articles:

2. Devoe Paint. www.devoepaint.com
3. Glidden Professional (Glidden) www.gliddenprofessional.com (approved equals to products listed)

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: As selected by Architect from manufacturer's full line of standard color selections.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.

1. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils (0.203 mm).
2. Devoe Paint:Bloxfl 4000-1000 Interior/Exterior Heavy Duty Acrylic Block Filler: Applied at a dry film thickness of not less than 7.0 to 14.5 mils (0.178 to 0.368 mm).

2.4 EXTERIOR PRIMERS

A. Exterior Wood Primer for Acrylic Enamels: Factory-formulated alkyd or latex wood primer for exterior application.

1. Sherwin-Williams; A-100 Exterior Latex Wood Primer B42W41: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
2. Devoe Paint: DR1502 Primz Exterior 100% Acrylic Wood Primer: Applied at a dry film thickness of 1.4 mils (.035 mm)

1. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

2. Devoe Paint: 4160-xxxx Devguard Multi-Purpose Tank & Structural Primer. Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

C. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.

1. Sherwin-Williams; Galvite HS Paint B50WZ3: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

2. Devoe Paint; 4160-XXXX Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

D. Exterior Concrete Block Primer:

1. Sherwin-Williams; Loxon Block Surfacer, A24W200: Applied at a dry film thickness of not less than 8.0 mils.

2.5 INTERIOR PRIMERS

A. Interior Concrete (other than CMU): Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.

1. Sherwin-Williams; PrepRite Masonry Primer B28W300: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

2. Devoe Paint: DRH6502 WB Pigmented Bonding Coat at a dry mil thickness of not less than 1.4 mils (0.035mm).

B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.

1. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).

2. Devoe Paint: DR50801 Prizm Latex High Hiding Wall Primer/Sealer. Applied at a dry film thickness of 1.2 mils (.030 mm).

C. Interior Wood Primer for Acrylic-Enamel: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.

1. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).

2. Devoe Paint: DR51801 Prizm KilnStain Interior/Exterior Acrylic Primer- Applied at a dry film thickness of not less than 1.7 mils (.043 mm).


1. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

2. Devoe Paint: 4160-xxxx Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

E. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.

1. Sherwin-Williams; Galvite HS B50WZ30: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

2. Devoe Paint: 4160-XXXX Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

F. Interior Dryfall Undercoat: Factory-formulated alkyd undercoat for exposed roof structure, roof deck, and cementitious wood fiber planks.
1. S-W: Waterborne Acrylic Dry Fall, B42 Series.

2.6 EXTERIOR FINISH COATS

   1. Sherwin-Williams; A-100 Exterior Latex Flat House & Trim Paint A6 Series: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
   2. Devoe Paint: DR15xx Wondershield Exterior 100% Acrylic Flat Finish – minimum dry mil thickness of 1.4 mils (.035 mm).

   1. Sherwin-Williams; A-100 Exterior Latex Satin House & Trim Paint A82 Series: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).<Insert manufacturer's comparable exterior finish-coat material.>
   2. Devoe Paint: DR16xx Wondershield Exterior 100% Acrylic Satin Finish- minimum dry mil thickness- 1.3 mils (.033 mm).

   1. Sherwin-Williams; SuperPaint Exterior High Gloss Latex Enamel A85 Series: Applied at a dry film thickness of not less than 1.2 mils (0.031 mm).
   2. Devoe Paint: DR18xx Wondershield Exterior 100% Acrylic Gloss Finish, minimum dry mil thickness of 1.4 mils (.035 mm).

   1. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils (0.061 mm).
   2. Devoe Paint: Devflex #4208-XXXX Acrylic Gloss- minimum dry mil thickness- 1.5 mils (.038 mm).

   1. Sherwin-Williams; Industrial Enamel B-54 Series: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
   2. Devoe Paint: 4308-xxxx Devguard Alkyd Industrial Gloss Enamel. Applied at a dry film thickness of not less than 2.0 mils. (0.051mm).

2.7 INTERIOR FINISH COATS

A. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
   1. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss Enamel B31W200 Series: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
   2. Devoe Paint: DRN39xx Wonder Tones Interior Semi Gloss Latex Enamel: Applied at a dry film thickness of not less than 1.5 mils (.038 mm).

B. Interior Semigloss Alkyd Enamel: Factory-formulated semigloss alkyd enamel for interior application.
   1. Sherwin-Williams; ProMar 200 Interior Alkyd Semi-Gloss Enamel B34W200 Series: Applied at a dry film thickness of not less than 1.7 mils (0.043 mm).
   2. Devoe Paint: DR26xx Velour Alkyd Semi Gloss Enamel: Applied at dry film thickness of not less than 1.7 mils (.043 mm).

C. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block:
   1. Semigloss Finish: One finish coat over an intermediate coat and a block filler.
2.8 INTERIOR WOOD STAINS AND VARNISHES

A. Open-Grain Wood Filler: Factory-formulated paste wood filler applied at spreading rate recommended by manufacturer.

1. Sherwin-Williams; Sher-Wood Fast-Dry Filler.

B. Interior Waterborne Clear Satin Varnish: Factory-formulated clear satin acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.

1. Sherwin-Williams; Wood Classics Waterborne Polyurethane Satin, A67 Series. Applied at a dry film thickness of not less than 4.0 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease,
oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer’s written instructions.
c. Clean concrete floors to be painted with a 5 percent solution of muratic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
b. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC’s recommendations.

a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 10/NACE No. 2.
b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer’s written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer’s written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term “exposed surfaces” includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Electrical items to be painted include, but are not limited to, the following:

1. Electrical equipment that is indicated to have a factory-primed finish for field painting.
2. Roof Top Equipment.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

### 3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.

2. Testing agency will perform appropriate tests for the following characteristics as required by Owner:
   
   a. Quantitative materials analysis.
   b. Abrasion resistance.
   c. Apparent reflectivity.
   d. Flexibility.
   e. Washability.
   f. Absorption.
   g. Accelerated weathering.
   h. Dry opacity.
   i. Accelerated yellowness.
   j. Recoating.
   k. Skinning.
   l. Color retention.
   m. Alkali and mildew resistance.

3. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

### 3.5 CLEANING

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

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

### 3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide “Wet Paint” signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

### 3.7 EXTERIOR PAINT SCHEDULE
A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

   1. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a rust-inhibitive primer.

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:

   1. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a galvanized metal primer.

3.8 INTERIOR PAINT SCHEDULE

A. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:

   1. Semigloss Acrylic-Enamel Finish: Two finish coats over a block filler.
      a. Block Filler: Concrete unit masonry block filler.
      b. Finish Coats: Interior Semigloss acrylic enamel.

B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

   1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
      a. Primer: Interior gypsum board primer.

C. Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces:

   1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
      b. Finish Coats: Interior semigloss acrylic enamel.

D. Ferrous Metal: Provide the following finish systems over ferrous metal:

   1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
      b. Finish Coats: Interior semigloss acrylic enamel.

E. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:

   1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
      b. Finish Coats: Interior semigloss acrylic enamel.

F. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:

   1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.
      a. Finish Coats: Interior flat latex-emulsion size.
G. Exposed roof structure, roof deck, and cementitious wood fiber planks: provide the following finish systems
   b. Finish coat: Interior Dryfall.

3.9 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

A. Stained Woodwork: Provide the following stained finishes over new interior woodwork:

   1. Polyurethane Stain Satin-Varnish Finish: Three finish coats of polyurethane clear satin varnish over a
      sealer coat and waterborne interior wood stain. Wipe wood filler before applying stain.
      a. Filler Coat: Open-grain wood filler.
      b. Stain Coat: Interior wood stain.
      c. Sealer Coat: Clear sanding sealer.
      d. Finish Coats: Interior polyurethane clear satin varnish.

END OF SECTION 09 91 13
SECTION 101100 - VISUAL DISPLAY UNITS

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.

SUMMARY

A. This Section includes the following:

1. Porcelain enamel markerboards.
2. Cork tackboards.

1.2 SUBMITTALS

A. Product Data: For each type of visual display board indicated.

B. Shop Drawings: For each type of visual display board required.

1. Include dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length.
2. Include sections of typical trim members.
3. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and textures available for the following:

1. Markerboards: Actual sections of porcelain enamel finish for each type of markerboard required.
2. Cork Tackboards: Actual sections of tackboard finish for each type of cork tackboard indicated.

D. Samples for Verification: Of the following products, showing color and texture or finish selected. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected. Prepare Samples from the same material to be used for the Work.

1. Visual Display Boards: Sample panels not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on the substrate indicated for the final Work. Include a panel for each type, color, and texture required.
2. Aluminum Trim and Accessories: Samples of each finish type and color, on 6 inch (150 mm) long sections of extrusions and not less than 4 inch (100 mm) squares of sheet or plate. Include Sample sets showing the full range of color variations expected.

E. Product Certificates: Signed by manufacturers of tackboards certifying that vinyl-fabric-faced cork tackboard materials furnished comply with requirements specified for flame-spread ratings.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain visual display boards through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide vinyl-fabric-faced tackboards with the following surface-burning characteristics as determined by testing assembled materials composed of facings and backings identical to those required in this Section per ASTM E 84 by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify vinyl-fabric-faced tackboards with appropriate markings of applicable testing and inspecting agency.

1. Flame Spread: 25 or less.
2. Smoke Developed: 10 or less.
1.4 WARRANTY

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

B. Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.

1. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Porcelain Enamel Markerboards:
   a. Aarco Products Inc. 800-989-2348 www.aarco.com
   b. ACCO Brands 800-541-0094 www.acco.com
   c. ADP Lemco, Incorporated 800-615-4000 www.adplemco.com
   d. Claridge, Inc. 800-434-4610 www.claridgeproducts.com
   e. MooreCo, Inc. 800-749-2258 www.moorecoinc.com
   g. Platinum Visual Systems 800-498-2990 www.pvsusa.com
   h. Polyvision 800-620-7659 www.polyvision.com

2. Tackboards:
   a. Aarco Products Inc. 800-989-2348 www.aarco.com
   b. ACCO Brands 800-541-0094 www.acco.com
   c. ADP Lemco, Incorporated 800-615-4000 www.adplemco.com
   d. Claridge, Inc. 800-434-4610 www.claridgeproducts.com
   e. MooreCo, Inc. 800-749-2258 www.moorecoinc.com
   g. Platinum Visual Systems 800-498-2990 www.pvsusa.com
   h. Polyvision 800-620-7659 www.polyvision.com
   i. Forbo Flooring North America 800-842-7839 www.forboflooringna.com

2.2 MATERIALS

A. Markerboards: Balanced, high-pressure-laminated, porcelain enamel markerboards of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: 0.024 inch (0.61 mm) enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat exposed face and edges with a 3-coat process consisting of primer, ground coat, and color cover coat. Coat concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at manufacturer's standard firing temperatures, but not less than 1200 deg F (649 deg C).
   a. Cover Coat: For markerboards, provide manufacturer's standard, light-colored, special writing surface with gloss finish intended for use with erasable dry markers.

2. Core: 3/8 inch (9.5 mm) thick, particleboard core material complying with requirements of ANSI A208.1, Grade 1-M-1.

3. Backing Sheet: 0.015 inch (0.38 mm) thick, aluminum-sheet backing.

4. Laminating Adhesive: Manufacturer's standard, moisture-resistant, thermoplastic-type adhesive.
VISUAL DISPLAY UNITS

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B. Natural-Cork Tackboards: 1/4 inch (6 mm) thick, natural cork sheet factory laminated to backing, at manufacturer’s option to provide warrantable product. Provide color and texture as scheduled or as selected from manufacturer’s standards.

   1. Backing: 1/4 inch (6 mm) hardboard or particleboard.

2.3 ACCESSORIES

A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062 inch (1.57 mm) thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure. Where tackboards are combined with markerboards, chalktrays and map rails shall be continuous across width of combination unit.

   1. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
   2. Chalktray: Manufacturer's standard, continuous, box-type, aluminum chalktray with slanted front and cast-aluminum end closures for each markerboard.
   3. Map Rail: Furnish map rail at top of each unit, complete with the following accessories:
      4. Display Rail: Provide continuous cork display rail approximately 1 inch (25 mm) wide, with map rail.
      5. End Stops: Provide one end stop at each end of map rail.
      6. Map Hooks: Provide 2 map hooks with flexible metal clips for every 48 inches (1220 mm) of map rail or fraction thereof.
      7. Flag Holder: Provide two flag holders for each room.

2.4 FABRICATION

A. Fabrication: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.

   1. Cut joints straight and true. Space joints symmetrically. Fit and match panels before shipment to provide a continuous, uniform writing surface.
   2. Length: Furnish panels approximately equal in length with permissible variation not more than 3 inches (75 mm) in either direction of equal spacing. Allow 1/4 inch (6.4 mm) clearance at trim in length and width for fitting. Provide lengths of panels in each space as follows:

      a. Up to 16 feet, 1 panel.
      b. More than 16 feet but less than 32 feet, 2 panels.

B. Assembly: Provide factory-assembled markerboard and tackboard units, unless field-assembled units are required.

   1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
   2. Provide manufacturer's standard vertical joint system between abutting sections of markerboards.
   3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards.

2.5 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.

1. Surfaces to receive markerboards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of markerboards.

2. Surfaces to receive tackboards shall be dry and free of substances that would impair the bond between tackboards and substrate.

3. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install units in locations and at mounting heights indicated and according to manufacturer’s written instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

C. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.3 ADJUSTING AND CLEANING

A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

B. Clean units according to manufacturer's written instructions.

END OF SECTION 101100
SECTION 101400 - SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following types of signs:

1. Dimensional letters and numbers.
2. Cast metal plaques.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

1. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
2. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
3. Provide message list for each sign required, including large-scale details of wording and lettering layout.
4. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.

B. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.

1. Furnish full-size rubbings for metal plaques.

C. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for initial selection of color, pattern, and texture:
   a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer’s color charts consisting of actual sections of material including the full range of colors available for each material required.

2. Samples for verification of color, pattern, and texture selected and compliance with requirements indicated:
   a. Cast Acrylic Sheet and Plastic Laminate: Provide a sample panel not less than 8-1/2 inches by 11 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

D. Dimensional Letters: Provide full-size representative samples of each dimensional letter type required, showing letter style, color, and material finish and method of attachment

1.4 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
C. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

D. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Manufacturers of Dimensional Letters:
   a. Andco Industries Corp. 1-800.476.8900  www.andco.com
   c. ASI Sign Systems, Inc. 817.399.1303  www.asisign.com
   d. Gemini, Inc. 1-800-538-8377  www.signletters.com
   e. Matthews International Corp. 1-800-284-8242  www.matthewsgsd.com
   f. Metal Arts. 800-237-8069  www.metalartslettersandplaques.com
   g. Metallic Arts. Inc. 1-800-541-3200  www.metallicarts.com
   h. The Southwell Company. 1-800-950-8068  www.southwellco.com/metalletters.html
   i. Spanjer Brothers, Inc.

2. Manufacturers of Cast Plaques:
   a. Andco Industries Corp. 1-800.476.8900  www.andco.com
   c. Gemini, Inc. 1-800-538-8377  www.signletters.com
   d. Metal Arts. 800-237-8069  www.metalartslettersandplaques.com
   e. OMC Industries, Inc. 1-800-488-4662  www.omc-bronze.com
   g. Vomar Products, Inc. 818-786-8085  www.vomarproducts.com/index.html

2.2 MATERIALS

A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested according to ASTM D 790, with a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:

   1. Transparent Sheet: Where sheet material is indicated as "clear," provide colorless sheet in matte finish, with light transmittance of 92 percent, when tested according to the requirements of ASTM D 1003.
   2. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer’s standards.

B. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by the sign manufacturer for the casting process used and for the use and finish indicated.

C. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

D. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
E. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended.

2.3 DIMENSIONAL LETTERS AND NUMBERS

A. Cast Letters and Numbers: Form individual letters and numbers by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.

1. Metal: Aluminum
2. Letter Height: As indicated.
3. Letter Style: As indicated.

2.4 CAST METAL PLAQUES

A. Plaques: Castings shall be free from pits, scale, sand holes, or other defects. Comply with requirements specified for metal, border style, background texture, and finish and with requirements shown for thickness, size, shape, and copy. Hand-tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish. Refer to the "Finishes" Article for other finish requirements.

1. Metal: Aluminum.
2. Border Style: Plain bevel.
3. Background Texture: Manufacturer's standard leatherette finish.

2.5 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.

B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.

C. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

   a. Organic Coating: Thermosetting-modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils, medium gloss.
   1.) Color: As selected by the Architect from the manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.

1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.

1. Flush Mounting: Mount letters with backs in contact with the wall or mounting surface.
C. Cast Metal Plaques: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.

1. Concealed Mounting: Mount the plaques by inserting threaded studs into tapped lugs on the back of the plaque. Set in predrilled holes filled with quick-setting cement.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 101400
SECTION 102113 - TOILET COMPARTMENTS

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. Component and installations shall comply with Texas State Purchasing Requirements and with Americans with Disabilities Act (ADA) or Texas Accessibility Standards (TAS), whichever is more stringent.

B. School toilet partitions receive substantial abuse. Toilet partitions shall be constructed and installed to withstand heavy abuse.

C. This Section includes solid-polymer units as follows:

1. Toilet Enclosures: Floor anchored, overhead braced.
2. Urinal Screens: Floor anchored in addition to wall mounted

Related Sections include the following:

D. 1. Division 6 Section "Rough Carpentry" for blocking.
2. Division 10 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

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

   1. Show locations of cutouts for compartment-mounted toilet accessories.
   2. For metal units, show locations of reinforcements for compartment-mounted grab bars.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

PART 2 – PRODUCTS

2.1 SOLID-POLYMER UNITS

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

   3. Ampco. (305) 821-5700 www.ampco.com
5. Hadrian Inc. (440) 974-7120 www.hadrian-inc.com

B. Toilet Partitions: Shall be floor mounted, overhead braced, with non corrosive panels and pilasters as manufactured by Scranton Products or comparable products with hardware as specified herein.

C. Door, Panel, Pilaster, and Pilaster Shoe Construction: Doors, pilasters, and pilaster shoes shall be fabricated from polymer resins under high pressure forming a single component section which is waterproof, non-absorbent and has a self lubricating surface that resists marking with pens, pencils or other writing utensils.
   1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns.

D. Brackets (Fittings):
   1. Full-Height Continuous Type: Manufacturer's standard design; stainless steel.

2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. Single component construction of solid Poly-Mar HD in colors that extent from the surface throughout the entire thickness of the panels, doors, and pilasters.

B. Doors, panels, and pilasters shall be 1” thick and all edges machined to a radius of .250” and all exposed surfaces to be free from saw marks.

C. Dividing panels shall be 55” high and mounted 14” above finished floor.

D. Pilasters shall be 82” high and fastened to a 3” high, solid plastic shoe.

E. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

F. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

G. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be accessible to people with disabilities.
   1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
   2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:
   a. Pilasters and Panels: 1/2 inch (13 mm).
   b. Panels and Walls: 1 inch (25 mm).

2. Stirrup Brackets: Secure panels to walls and to pilasters with not less than two brackets attached near top and bottom of panel.
   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches (50 mm) into structural floor, unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

D. Floor Anchored in addition to Wall-Hung Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following toilet accessory items:
   1. Paper Towel Dispenser.
   2. Combination towel dispenser/waste receptacle unit.
   3. Toilet tissue dispenser.
   4. Grab bars.
   5. Soap dispenser.
   6. Mop and broom holder.
   7. Double robe hook.
   8. Stainless steel framed mirror units.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

B. Product Data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gages, profiles, method of mounting, specified options, and finishes.

C. Schedule: Indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.

D. Setting Drawings: Where cutouts are required in other work, provide templates, substrate preparation instructions, and directions for preparing cutouts and for installation of anchorage devices.

1.4 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish inserts and anchoring devices that must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

1.5 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.6 WARRANTY
A. Special Project Warranty: Provide manufacturer's written 5-year warranty against silver spoilage of mirrors, agreeing to replace any mirrors that develop visible defects within warranty period.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide toilet accessories by one of the following:

1. Toilet and Bath Accessories
   b. American Specialties, Inc. 914.476.9000 www.americanspecialties.com
   c. Bobrick Washroom Equipment, Inc. 1-800-553-1600 www.bobrick.com
   d. Bradley Corporation. 262-251-6000 www.bradleycorp.com
   e. General Accessory Manufacturing Co. 1-800-451-5766 www.gamcus.com
   f. McKinney/Parker.
   i.

2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22-gage (.034-inch) minimum thickness, unless otherwise indicated.


C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gage (.040-inch) minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527, G60.

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

F. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.

G. Vinyl-Backed Safety Mirror Glass: Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro- plated copper coating, and protective organic coating. Apply vinyl backing with pressure-sensitive adhesive coating over glass coating by method recommended by vinyl-backing manufacturer to produce a surface free of bubbles, blisters, or other imperfections. Use adhesives and vinyl backing compatible with glass coating as certified by organic coating manufacturer.


I. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

J. Keys: Unless otherwise indicated, provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six (6) keys to Owner's representative and obtain receipt.

2.3 PAPER TOWEL DISPENSER:

A. Surface Mounted Paper Towel Dispenser: Georgia Pacific Vista Hygienic Push Paddle Roll Dispenser. Manufacturer's service and parts manual shall be provided to Owner in closeout documents.

B. Surface Mounted Paper Towel Dispenser: Tork #84TR H21 system Hand Towel Roll Dispenser, Lever auto transfer. Manufacturer's service and parts manual shall be provided to Owner in closeout documents.

2.4 TOILET TISSUE DISPENSERS:

A. Surface mounted Two-Roll Dispenser: Royce Rolls, satin-finish stainless steel unit.
2.5 GRAB BARS:

A. Bobrick, Series B-6806, Construction shall be 18 gage, satin-finish stainless steel tubing 1 ½” in diameter. Concealed mounting flanges shall be 1/8” thick, type 304 stainless steel plates, with screw holes for concealed anchors. Cover plate shall be 22 gauge, type 304 stainless steel with satin finish, 3 ¼” diameter. Cover shall snap over mounting flange to conceal screws.

B. Clearance: 1-1/2 inches clearance between wall surface and inside face of bar.

C. Gripping Surfaces: Satin-finish stainless steel.

D. Heavy-Duty Size: Outside diameter of 1-1/2 inches.

E. Length: 48”, at sides of water closet; 36”, behind water closet.

2.6 SOAP DISPENSERS:

A. Surface mounted dispenser: Bobrick, B-4112 Contura Series, vertical tank with satin-finish stainless steel. Valve shall dispense all-purpose hand soaps. Capacity shall be 40 fl oz. Unit shall be vandal resistant with a soap refill window, concealed wall fastening, and hinged filler-top.

2.7 MISCELLANEOUS ACCESSORIES:

A. Mop and Broom Holder: Bobrick, B-239, 18-gage, Type 304 stainless steel with satin-finish; 34” Long, 13” H, 10” D, with three spring-loaded rubber cam anti slip mop holders capable of gripping mop handles 7/8” to 1 ¼” in diameter and four stainless steel hooks.

B. Double Robe Hook: Bobrick, Classic Series, B-76727, Heavy-duty satin-finish stainless steel contoured 4” wide bar with back plate for concealed mounting. Provide coat hooks at single user restrooms.

2.8 MIRROR UNITS:

A. Stainless Steel Framed Mirror Units: Bobrick, Series B-165, channel-frame mirrors, one piece, ½” x ½” x ½” channel-frame with 430 stainless steel, satin-finish. Units shall have mitered corners with No. 1 quality ¼” glass mirror warranted against silver spoilage for 10 years, and galvanized steel back. Units shall be secured to wall with theft-resistant concealed wall hangers.

2.9 FOLDING SHOWER SEAT

A. Heavy-duty hinged seat designed to fold up against wall when not in use. Provide support braces, hinges, frame, and fasteners of Type 304 stainless steel. Construct frame of all welded tubular construction for maximum strength. Provide seat with configuration and seating surface material as follows:

1. Configuration: “L”-shaped seat, designed for easy wheelchair access.

2. Seat Material: Phenolic or polymeric composite of one-piece construction. Color as selected from manufacturer's standard selections.

2.10 FABRICATION

A. General: Only a maximum 1-1/2-inch diameter, unobtrusive stamped logo of manufacturer, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent accumulation of moisture, as follows:

1. Provide galvanized steel backing sheet, not less than 22 gage (.034 inch) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror Unit Hangers: Provide system of mounting mirror units that will permit rigid, tamperproof, and theft proof installation, as follows:

Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring special tool to remove.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units in accordance with manufacturers' instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, in accordance with manufacturer's instructions for type of substrate involved.

C. Install grab bars to resist tensile and moment forces generated by a load of 250 lb. applied in any direction, or as otherwise required by authorities having jurisdiction, whichever is more stringent.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 102800
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Portable fire extinguishers.
   2. Fire-protection cabinets for the following:
      a. Portable fire extinguishers.
      b. Portable fire blankets.
   3. Fire-protection accessories.
   4. Fire Department lock boxes.

B. Related Sections include the following:
   1. Division 7 Section “Firestopping” for firestopping sealants at fire-rated cabinets.
   2. Division 10 Section “Signs” for directional signage to out-of-sight fire extinguishers and cabinets.
   3. Division 11 Section “Food Service Equipment” for fire extinguishing systems provided as part of exhaust hoods.
   4. Division 16 Section "Interior Lighting" for fire extinguisher location lights.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
   Fire Extinguishers: Include rating and classification.
   Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Samples for Initial Selection: Manufacturer’s color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.

C. Samples for Verification: For each type of exposed cabinet finish required, prepared on Samples of size indicated below and of same thickness and material indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
   1. Size: 6-by-6-inch- (150-by-150-mm-) square Samples.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers, fire blankets, and cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, “Standard for Portable Fire Extinguishers.”

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide extinguishers listed and labeled by FM.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Portable Fire Extinguishers:
   b. General Fire Extinguisher Corporation. 800-323-6452 www.genfire.com
   e. Larsen's Manufacturing Company. 800-527-7367 www.larsensmfg.com

2. Fire-Protection Cabinets:
   c. Larsen's Manufacturing Company. 800-527-7367 www.larsensmfg.com

3. Lock Boxes:

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

2.3 PORTABLE FIRE EXTINGUISHERS

A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.

B. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, in enameled-steel container.

2.4 PORTABLE FIRE BLANKETS

A. Fire Blankets: Minimum 62" x 80", fabricated from reprocessed wool, in compliance with local requirements and Federal Specification #CS-191-53. Provide a fire blanket at each science lab and prep room.

2.5 FIRE-PROTECTION CABINETS

A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.


B. Cabinet Type: Suitable for the following:

   1. Fire extinguisher: Where indicated, provide combination cabinet for housing fire extinguisher and fire blanket.

C. Cabinet Mounting: Suitable for the following mounting conditions:
1. Semirecessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.

D. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

2. Rolled-Edge Trim: 4-inch (102-mm) backbend depth.

E. Cabinet Trim Material: Manufacturer's standard, as follows:

1. Same metal and finish as door.

F. Door Material: Manufacturer's standard, as follows:

1. Steel sheet.

G. Door Glazing: Manufacturer's standard, as follows:

1. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, as follows:
   a. Class 1 (clear).

H. Door Style: Manufacturer's standard design, as follows:

1. Fully glazed panel with frame.

I. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.

1. Provide minimum 1/2-inch-(13-mm-) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.

J. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.6 ACCESSORIES

A. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.

1. Provide brackets for extinguishers not located in cabinets.

2. Provide brackets for extinguishers located in cabinets.

B. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.

2. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.


5. Orientation: Vertical.

2.7 FIRE DEPARTMENT LOCK BOXES

A. Provide locking security box for fire department and other authority access to building, as required by local authorities. Coordinate specific requirements with local authorities. Unless otherwise indicated or directed, provide security boxes or other devices as manufactured by Knox Company; 17672 Armstrong Avenue, Irvine, CA 92614-5728; (800) 552-5669, Fax (949) 252-0482.

2.8 COLORS AND TEXTURES
2.9 FINISHES, GENERAL

A. Colors and Textures: As selected by Architect from manufacturer's full range for these characteristics.

2.9.1 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:
   1. Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.
   2. Interior of cabinets and doors.

2.10 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
   1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for hose valves, hose racks, and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets are to be installed.

C. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged units.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing fire-protection specialties.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
   1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
   2. Fasten mounting brackets to structure and cabinets, square and plumb.
   3. Fasten cabinets to structure, square and plumb.
   4. Provide fire department security boxes at locations as directed or indicated.
3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. Refinish or replace cabinets and doors damaged during installation.

C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 104400
SECTION 10 56 13 - METAL STORAGE SHELVING

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Extent, location and details of metal storage shelving are indicated on drawings and in schedules.

1.3 SUBMITTALS
   A. Product Data: Submit manufacturer's product literature and installation instructions for each type of metal storage systems and installation accessory required. Include methods of installation for each type of substrate.
      1. Submit written data on physical characteristics, durability, resistance to fading and flame resistance characteristics.
   B. Maintenance Data: Include data in Maintenance Manual specified in Division 1.
   C. Shop Drawings: Submit shop drawings showing location, ranges and extent of metal shelving systems. Show installation details at any special or non-standard conditions.
   D. Samples for Verification Purposes: Submit 6 inch square samples of each color and finish required. Prepare from same material to be used for the Work.

1.4 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Firm (material producer) with not less than 3 years of production experience, whose published literature clearly indicates general compliance of products with requirements of this Section.
   B. Installer Qualifications: Firm specializing in metal storage shelving installation with not less than 2 years of experience in installation of metal storage shelving similar to that required for this project.
   C. Single Source Responsibility: Provide material produced by a single manufacturer for each shelving unit type.

1.5 DELIVERY, STORAGE AND HANDLING
   A. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

1.6 SEQUENCING AND SCHEDULING
   A. Sequence metal storage shelving installation with other work to minimize possibility of damage and soiling during remainder of construction period.

1.7 WARRANTY
   A. Special Project Warranty: Submit a written warranty, executed by the Contractor, Installer and the Manufacturer, agreeing to repair or replace shelving units which fail in materials or workmanship within the specified warranty period. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.
   B. Warranty period is 2 years after the date of Substantial Completion.
1.8 **MAINTENANCE**

A. **Maintenance Instructions:** Submit manufacturer's printed instructions for maintenance of installed Work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against materials and methods which may be detrimental to finishes and performance.

B. **Replacement Materials:** After completion of Work, deliver not less than 2 of each type, color, and pattern of metal storage shelving, exclusive of material required to properly complete installation. Furnish 2% of accessory components as scheduled. Furnish replacement materials from same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels.

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### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

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

1. ACME VISIBLE Filing Systems Ltd. 604-501-7675 [www.acmevisible.com](http://www.acmevisible.com)
2. Lyon Metal Products, Inc. 800-323-0082 [www.lyonmetal.com](http://www.lyonmetal.com)
3. Penco 800-562-1000 [www.pencoproducts.com](http://www.pencoproducts.com)
5. Tab Products Co LLC 888-466-8228 [www.tab.com](http://www.tab.com)

#### 2.2 MATERIALS

A. **General:** Minimum 18 gauge cold-rolled steel sheet metal, washed to receive powder coated baked enamel finish, higher gauge where indicated to provide appropriate loading capacity.

B. **Open Shelving:** Provide heavy-duty open shelving units consisting of four upright corner pilasters, 13 gage, slotted to receive clips clipped together with shelves as indicated. Provide cross-braces laterally and at ends as required for stability with intended load. Shelves adjustable 1-1/2 inches on center. Provide 36 inches wide by 84 inches high units, unless otherwise indicated on drawings or in specifications.

1. **Shelf Depth:** Provide shelving of standard depth as scheduled or indicated.
2. **Unit Configuration:** Provide shelf units in configuration as follows:
   a. **Standard Upright Assembly:** Provide complete unit equipped with four uprights; shelves and top designed to stand independently where single unit scheduled.
   b. **Starter/Adder Assembly:** Provide first unit of each bank with four uprights; shelves and top to stand independently. Provide each succeeding unit with two uprights; shelves and top to allow attachment to preceding unit. Provide one upright assembly at the end of each bank. Provide where multiple units scheduled.
3. **Shelves:** Provide units with number of shelves as scheduled or indicated, or if not scheduled or indicated, provide fixed bottom shelf and four (4) intermediate adjustable shelves.
   a. **Reinforced Shelves:** Number of shelves as scheduled or indicated.

#### 2.3 FINISHES

A. **Provide units in finishes and colors as selected by Architect from manufacturer's standard finishes and colors.**

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### PART 3 - EXECUTION

#### 3.1 INSPECTION

A. **Inspect areas and conditions in which metal storage shelving will be installed.** Verify locations of power feeds, positioning of exits and aisle ways and overall dimensions of space, including height and HVAC venting.
3.2 PREPARATION

A. Prior to installation of shelving system, vacuum floor surface to remove dust, debris and loose particles. Resilient flooring wet mopped and dried or finish buffed. Verify that components, including size and finish are those specified before installing.

3.3 INSTALLATION

A. Install shelving system and accessories after finishing operations, including painting have been completed. Install system to comply with final layout drawings, in strict compliance with manufacturers printed instructions. Position units level, plumb; at proper location relative to adjoining units and related work. Adjust accessories to provide visually acceptable installation.

3.4 FIELD QUALITY CONTROL

A. Remove and replace shelving components which are chipped, scratched, or otherwise damaged and which do not match adjoining work. Provide new matching units, installed as specified and in manner to eliminate evidence of replacement.

3.5 ADJUST

A. Adjust components and accessories to provide visually acceptable installation.

3.6 CLEANING

A. Immediately upon completion of installation, clean components and surfaces following manufacturer's recommended procedures.

B. Remove surplus materials, rubbish and debris resulting from installation upon completion of Work and leave areas of installation in neat, clean condition.

3.7 DEMONSTRATION

A. Upon completion of installation of system, inspect and determine capability and compliance with requirements. Repair or replace units which are not functional. All shelves and/or accessories shall be smoothly in place with no visual buckling or non-alignment of parts evident.

3.8 PROTECTION

A. Protect system against damage during remainder of construction period. Advise owner of additional protection needed to ensure that system will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 10 56 13
PART 1 – GENERAL

.01 SECTION INCLUDES
   A. Design and installation of extruded aluminum walkway covers and canopies.

.02 RELATED WORK
   A. Concrete
   B. Sealants

1.03 REFERENCES
   A. The Aluminum Association- Aluminum Design Manual 2010

1.04 SUBMITTALS
   A. Manufacturers brochures, manuals and literature.
   B. Shop drawings of the complete canopy layout, includes sections and details specific to project and bearing
      the seal of a registered structural engineer.
   C. Samples of canopy finishes.

1.05 QUALITY ASSURANCE
   A. Canopy shall be designed to comply with local building codes.
   B. Canopy manufacturer shall have a minimum of 10 years’ experience in designing and installing the specified
      system.
   C. The installation of the canopy shall be performed by the manufacturer to assure single source responsibility.

Part 2 – Products

2.01 MANUFACTURER – BASIS OF DESIGN
   AVAdex Walkway Covers & Canopies
   Style: Walkway U-Bent Canopy

2.02 MATERIALS
   A. All components shall be 6063; 6061 or 6005 alloy extruded aluminum.
   B. Components shall be sized to comply with live load and wind load requirements of the project and shall not be
      less than the dimensions shown on the plan.
   C. The thickness of the aluminum deck panels shall be at least .080” thick.
   D. All columns shall have radius corners.
   E. Beams are open at top to drain canopy system internally into columns.
   F. Flashing shall be .040” thick.
   G. All bolts and fasteners shall be stainless steel or finished to match adjacent components and sized by canopy
      engineer.

2.03 FINISHES
A. The finish and color selection of each component shall be chosen from the manufacturer’s standard color selections and shall include:

3. Anodized- Medium Bronze

**Part 3 – Execution**

3.1 FABRICATION

A. All welding shall be in compliance with AWS 1.2. The certification of each welder shall be available to verify compliance.

B. Canopy shall be designed to drain through beams to columns with water tight connections.

3.2 INSTALLATION

A. Install the canopy in strict accordance with the manufacturer’s recommendations.

B. Erect canopy after concrete and masonry with in vicinity is completed and washed down.

C. Install columns and beams straight and true.

D. Install raincaps over draining sections of the deck.

E. The general contractor shall finish the concrete around the columns to assure a uniform quality of workmanship and appearance with the adjacent surrounding concrete work.

F. Fill downspout columns with grout to the discharge level to prevent standing water.

G. Install flashing as required.

H. Care shall be taken to prevent damage or scratching during installation.

I. Thoroughly clean canopy after installation.

END OF SECTION 10 73 10
SECTION 10 75 00 - FLAGPOLES

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 ground-set flagpoles made from aluminum.
   B. Related Sections include the following:
      1. Division 3 Section "Cast-In-Place Concrete" for concrete footings for flagpoles.
      2. Division 7 Section "Joint Sealants" for elastomeric sealant filling the top of the foundation tube.

1.3 PERFORMANCE REQUIREMENTS
   A. Structural Performance: Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles."
      1. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
      2. Basic Wind Speed: 90 mph; 3-second gust speed at 33 feet (10 m) aboveground.

1.4 SUBMITTALS
   A. Product Data: For each type of flagpole required.
   B. Structural Calculations: For flagpoles indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   C. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE
   A. Source Limitations: Obtain each flagpole as a complete unit, including fittings, accessories, bases, and anchorage devices, from a single manufacturer.
      1. Obtain flagpoles through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
      2. The Baartol Company Inc. 800-537-4143 www.baartol.com
2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
2. For tapered flagpoles, provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

B. Aluminum Flagpoles: Provide entasis-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/ (B 241M), Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm). Heat treat after fabrication to comply with ASTM B 597, Temper T6.

C. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.064 inch (1.6 mm) minimum nominal wall thickness. Provide with 3/16 inch (4.8 mm) steel bottom plate and support plate; 3/4 inch (19 mm) diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

1. Provide flashing collar of same material and finish as flagpole.

2.3 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063 inch (1.6 mm) spun aluminum, finished to match flagpole.

B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16 inch (8 mm) diameter, braided polypropylene halyard and 9 inch (228 mm) cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

1. Provide two halyards and two cleats at each flagpole.
2. Provide cast-metal cleat covers, finished to match flagpole, secured with cylinder locks.
3. Provide halyard covers consisting of a 2 inch (50 mm) channel, 60 inches (1500 mm) long, finished to match flagpole.

C. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.

1. Provide with neoprene or vinyl covers.

2.4 MISCELLANEOUS MATERIALS

A. Concrete: Comply with requirements in Division 3 Section "Cast-In-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3,000 psi (20 MPa, unless otherwise indicated.)

B. Sand: ASTM C 33, fine aggregate.

C. Elastomeric Joint Sealant: Single-component neutral-curing silicone joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

2.5 FINISHES

A. Metal Finishes, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
1. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.

D. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.

E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to manufacturer’s written instructions.

B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2 inch (50 mm) layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 10 75 00