Texas A&M University – Corpus Christi

University Center Wall Replacement
Issued for Bid

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# THE TEXAS A&M UNIVERSITY SYSTEM
## Uniform General and Supplementary Conditions
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Uniform General and Supplementary Conditions
For The Texas A&M University System

The Texas A&M University System has incorporated its Supplementary Conditions that apply to all A&M System and member institution construction projects into the Texas Building and Procurement Commissions’ Uniform General Conditions. Material changes are indicated by the bold and italicized typeface shown here. Superseded sections of the Texas Building and Procurement Commissions’ Uniform General Conditions are not included in the A&M System Uniform General and Supplementary Conditions. All users are advised to read and understand this entire document.

Article 1. Definitions

Unless the context clearly requires another meaning, the following terms have the meaning assigned herein:

1.1 Architect/Engineer (A/E) means a person registered as an architect pursuant to Tex. Occ. Code Ann., Chapter 1051, as a landscape architect pursuant to Tex. Occ. Code Ann., Chapter 1052, a person licensed as a professional engineer pursuant to Tex. Occ. Code Ann., Chapter 1001 and/or a firm employed by Owner or a design-build contractor to provide professional architectural or engineering services and to exercise overall responsibility for the design of a Project or a significant portion thereof, and to perform the contract administration responsibilities set forth in the Contract.

1.2 Change Order means a written modification of the Contract between the Owner and Contractor, signed by the Owner, the Contractor and the A/E.

1.3 Change Order Proposal means a Contractor-generated document in response to a Change Order Request (COR).

1.4 Close-out documents means the product brochures, product/equipment maintenance and operations instructions, manuals, and other documents/warranties, as-built record documents, affidavit of payment, release of lien and claim, and as may be further defined, identified, and required by the Contract Documents.

1.5 Contract means the entire agreement between the Owner and the Contractor, including all of the Contract Documents.

1.6 Contract Date is the date when the agreement between the Owner and the Contractor becomes effective.
1.7 *Contract Documents* means those documents identified as a component of the agreement (contract) between the Owner and the Contractor. These may include, but are not limited to, Drawings, Specifications, these Uniform General and Supplementary Conditions, Special Conditions, Change Orders, and all pre-bid and/or pre-proposal addenda.

1.8 *Contractor* means the individual, corporation, company, partnership, firm or other entity contracted to perform the Work, regardless of the type of construction contract used, so that the term as used herein includes a Construction Manager-at-Risk or a Design-Build firm as well as General or Prime Contractor. The Contract Documents refer to Contractor as if singular in number.

1.9 *Contract Sum* means the total compensation payable to the Contractor for completion of the Work in accordance with the terms of the Contract.

1.10 *Contract Time* means the period between the Date of Commencement (Start Date) identified in the Notice to Proceed with Construction and the Substantial Completion date identified in the Notice to Proceed or as subsequently amended by Change Order.

1.11 *Date of Commencement* means the date designated in the Notice to Proceed for the Contractor to commence the Work.

1.12 *Day* means a calendar day, unless otherwise specifically stipulated.

1.13 *Drawings* means that product of the A/E which graphically depicts the Work.

1.14 *Final Completion* means the date determined and certified by the A/E and Owner on which the Work is fully and satisfactorily complete in accordance with the Contract.

1.15 *Owner* means the State of Texas and any Agency of the State of Texas, acting through the responsible entity of the State of Texas, identified in the Contract as the Owner.

1.16 *Owner's Designated Representative (ODR)* means the individual assigned by the Owner to act on its behalf, and to undertake certain activities as specifically outlined in the Contract. The ODR is the only party authorized to direct changes to the scope, cost, or time of the Contract.

1.17 *Project* means all activities necessary for realization of the Work. This includes design, contract award(s), execution of the Work itself, and fulfillment of all contract and warranty obligations.
1.18 **Samples** mean representative physical examples of materials, equipment or workmanship, used to confirm compliance with requirements and/or to establish standards for use in execution of the Work.

1.19 **Schedule of Values** means the detailed breakdown of the cost of the materials, labor and equipment necessary to accomplish the Work as described in the Contract Documents, submitted by Contractor for approval by Owner and A/E.

1.20 **Shop Drawings** means the drawings, diagrams, illustrations, schedules, performance charts, brochures and other data prepared by the Contractor or its agents, which detail a portion of the Work.

1.21 **Site** means the geographical area of the location of the Work.

1.22 **Special Conditions** means the documents containing terms and conditions, which may be unique to the Project. Special Conditions are a part of the Contract Documents and have precedence over these Uniform General and Supplementary Conditions.

1.23 **Specifications** mean the written product of the A/E that establishes the quality and/or performance of products utilized in the Work and processes to be used, including testing and verification for producing the Work.

1.24 **Subcontractor** means a business entity that enters into an agreement with the Contractor to perform part of the Work or to provide services, materials or equipment for use in the Work.

1.25 **Substantial Completion** means the date determined and certified by the Contractor, A/E and Owner when the Work or a designated portion thereof is sufficiently complete, in accordance with the Contract, so as to be operational and fit for the use intended.

1.26 **Unit Price Work** means Work or a portion of the Work paid for based on incremental units of measurement.

1.27 **Unilateral Change Order** means a Change Order issued by the Owner without the agreement of the Contractor. A **Unilateral Change Order has the same effect as a contract modification.**

1.28 **Work** means the administration, procurement, materials, equipment, construction and all services necessary for the Contractor, and/or its agents, to fulfill the Contractor’s obligations under the Contract.
Article 2. Laws Governing Construction

2.1. Environmental Regulations. The Contractor shall conduct activities in compliance with applicable laws and regulations and other requirements of the Contract relating to the environment and its protection at all times. Unless otherwise specifically determined, the Owner is responsible for obtaining and maintaining permits related to stormwater run-off. The Contractor shall conduct operations consistent with stormwater run-off permit conditions. Contractor is responsible for all items it brings to the Site, including hazardous materials, and all such items brought to the Site by its Subcontractors and suppliers, or by other entities subject to direction of the Contractor. The Contractor shall not incorporate hazardous materials into the Work without prior approval of Owner, and shall provide an affidavit attesting to such in association with the request for the Substantial Completion Inspection.

2.2. Wage Rates. The Contractor shall not pay less than the wage scale of the various classes of labor as shown on the “Prevailing Wage Schedule” provided by the Owner. The specified wage rates are minimum rates only. The Owner is not bound to pay any claims for additional compensation made by any contractor because the Contractor pays wages in excess of the applicable minimum rate contained in the Contract. The “Prevailing Wage Schedule” is not a representation that qualified labor adequate to perform the Work is available locally at the prevailing wage rates.

2.2.1 Notification to Workers. The Contractor shall notify each worker, in writing, of the following as they commence work on the Contract: the worker’s job classification, the established minimum wage rate requirement for that classification, as well as the worker’s actual wage. The notice must be delivered to and signed in acknowledgement of receipt by the worker and must list both the wages and fringe benefits to be paid or furnished for each classification in which the worker is assigned duties. When requested by the Owner, the Contractor shall furnish evidence of compliance with the Texas Prevailing Wage Law.

2.2.1.1 The Contractor shall submit a copy of each worker wage-rate notification to the ODR with the application for progress payment for the period during which the worker was engaged in activities on behalf of the Project.

2.2.1.2 The “Prevailing Wage Schedule” is determined by the Owner in compliance with Tex. Gov’t Code, Chapter 2258. Should the Contractor at any time become aware that a particular skill or trade not reflected on the Owner’s Prevailing Wage Schedule will be or is being employed in the Work, whether
by the Contractor or by a Subcontractor, the Contractor shall promptly inform the ODR of the proposed wage to be paid for the skill along with a justification for same. The Contractor is responsible for determining the most appropriate wage for a particular skill in relation to similar skills or trades identified on the Prevailing Wage Schedule. In no case shall any worker be paid less than the wage indicated for Laborers.

2.2.1.3 Penalty for Violation. The Contractor and any Subcontractor will pay to the State a penalty of sixty dollars ($60) for each worker employed for each calendar day, or portion thereof, that the worker is paid less than the wage rates stipulated in the Prevailing Wage Schedule.

2.2.1.4 Complaints of Violations.

2.2.1.4.1 Owner’s Determination of Good Cause. Upon receipt of information concerning a violation of Tex. Gov’t Code, Chapter 2258, the Owner will, within 31 days, make an initial determination as to whether good cause exists that a violation occurred. The Owner will send documentation of the initial determination to the Contractor against whom the violation was alleged, and to the worker involved. Upon making a good-cause finding, the Owner will retain the full amounts claimed by the claimant or claimants as the difference between wages paid and wages due under the Prevailing Wage Schedule and any supplements thereto, together with the applicable penalties, such amounts being subtracted from successive progress payments pending a final decision on the violation.

2.2.1.4.2 If the Contractor and claimant worker reach an agreement concerning the claim, the Contractor shall promptly notify the Owner in a written document countersigned by the worker.

2.2.1.4.3 Arbitration Required. If the violation is not resolved within 14 days following initial determination by the Owner, the Contractor and the claimant worker must participate in binding arbitration in accordance with the Texas General Arbitration Act, Tex. Civ. Prac. & Rem. Code,
Chapter 171. If the Contractor and the claimant worker do not agree on an arbitrator within 10 days, after the date arbitration is required, a district court may be petitioned by any of the parties to the arbitration to appoint an arbitrator whose decision will be binding on all parties. (See Tex. Gov't Code, § 2258.053)

2.2.1.4.4 Arbitration Award. If an arbitrator assesses an award against the Contractor, the Contractor shall promptly furnish a copy of said award to the Owner. The Owner may use any amounts retained under Article 2.2.1.4.1 to pay the worker the amount as designated in the arbitration award. If the retained funds are insufficient to pay the worker in accordance with the arbitration award, the worker has a right of action against the Contractor, and/or the surety to receive the amount owed, plus attorneys’ fees and court costs. The Owner has no duty to release any funds to either the claimant or the Contractor until it has received the notices of agreement or the arbitration award.

2.2.1.4.5 No Extension of Time. If the Owner’s determination proves valid that good cause existed to believe a violation had occurred, the Contractor is not entitled to an extension of time for any delay arising directly or indirectly from the arbitration procedures set forth herein.

2.3. **Venue for Suits.** *The venue for any suit arising from the Contract will be in a court of competent jurisdiction in Brazos County, Texas.*

2.4. **Licensing of Trades.** The Contractor shall comply with all applicable provisions of state law related to license requirements for skilled tradesmen, contractors, suppliers and/or laborers, as necessary to accomplish the Work. In the event the Contractor, or one of its Subcontractors, loses its license during the term of performance of the Contract, the Contractor shall promptly hire or contract with a licensed provider of the service at no additional cost to the Owner.

2.5. **Royalties, Patents & Copyrights.** The Contractor shall pay all royalties and license fees, defend all suits or claims for infringement of any patent rights, and shall save the Owner harmless from loss on account thereof.
2.6. **State Sales and Use Taxes.** The Owner qualifies for exemption from certain State and Local Sales and Use Taxes pursuant to the provisions of Tex. Tax Code, Chapter 151. The Contractor may claim exemption from payment of applicable State taxes by complying with such procedures as prescribed by the State Comptroller of Public Accounts. *Contractor shall not be entitled to reimbursement for taxes paid on items that are exempt from taxation.*

**Article 3. General Responsibilities of Owner and Contractor**

3.1. **Owner’s General Responsibilities.** The Owner is the entity identified as such in the Contract and referred to throughout the Contract Documents as if singular in number.

3.1.1 **Preconstruction Conference.** Prior to, or concurrent with, the issuance of the Notice to Proceed with Construction, a conference will be convened for attendance by the Owner, Contractor, A/E and appropriate Subcontractors. The purpose of the conference is to establish a working understanding among the parties as to the Work, the operational conditions at the Project Site, and general administration of the Project. Topics include communications, schedules, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, maintaining required records and all other matters of importance to the administration of the Project and effective communications between the project team members.

3.1.2 **Owner’s Designated Representative.** Prior to the start of construction, Owner will identify the Owner’s Designated Representative (ODR), who has the express authority to act and bind the Owner to the extent and for the purposes described in the Contract, including responsibilities for general administration of the Contract.

3.1.2.1 Unless otherwise specifically defined elsewhere in the Contract Documents, the ODR is the single point of contact between the Owner and Contractor. Notice to the ODR, unless otherwise noted, constitutes notice to the Owner under the Contract.

3.1.2.2 All directives on behalf of the Owner will be conveyed to the Contractor by the ODR in writing.

3.1.3 **Owner Supplied Materials and Information.**
3.1.3.1 The Owner will furnish to the Contractor those surveys describing the physical characteristics, legal description, limitations of the Site, site utility locations, and other information used in the preparation of the Contract Documents.

3.1.3.2 The Owner will provide information, equipment, or services under the Owner’s control to the Contractor with reasonable promptness. **The Owner makes no representation as to the accuracy or completeness of the site information furnished to the Contractor by the Owner, and is not responsible for any interpretations or conclusions reached by the Contractor with respect to the information.**

3.1.4 Availability of Lands. The Owner will furnish, as indicated in the Contract, all required rights to use the lands upon which the Work occurs. This includes rights-of-way and easements for access and such other lands that are designated for use by the Contractor. The Contractor shall comply with all Owner-identified encumbrances or restrictions specifically related to use of lands so furnished. The Owner will obtain and pay for easements for permanent structures or permanent changes in existing facilities, unless otherwise required in the Contract Documents.

3.1.5 Limitation on Owner’s Duties.

3.1.5.1 The Owner will not supervise, direct, control or have authority over or be responsible for Contractor’s means, methods, technologies, sequences or procedures of construction or the safety precautions and programs incident thereto. The Owner is not responsible for any failure of Contractor to comply with laws and regulations applicable to the Work. The Owner is not responsible for the failure of Contractor to perform or furnish the Work in accordance with the Contract Documents. Owner is not responsible for the acts or omissions of Contractor, or any of its Subcontractors, suppliers or of any other person or organization performing or furnishing any of the Work on behalf of the Contractor.

3.1.5.2 The Owner will not take any action in contravention of a design decision made by the A/E in preparation of the Contract Documents, when such actions are in conflict with statutes under which the A/E is licensed for the protection of the public health and safety.
3.2 **Role of A/E.** Unless specified otherwise in the Contract between the Owner and the Contractor, the A/E shall provide general administration services for the Owner during the construction phase of the Project. Written correspondence, requests for information, and Shop Drawings/submittals shall be directed to the A/E for action. The A/E has the authority to act on behalf of the Owner to the extent provided in the Contract Documents, unless otherwise modified by written instrument, which will be furnished to the Contractor by the ODR, upon request.

3.2.1 **Site Visits**

3.2.1.1 The A/E will make visits to the Site at intervals as provided in the A/E’s contract agreement with the Owner, to observe the progress and the quality of the various aspects of Contractor’s executed Work and report findings to the Owner.

3.2.1.2 The A/E has the authority to interpret Contract Documents and inspect the Work for compliance and conformance with the Contract. Except as referenced in Article 3.1.5.2, the Owner retains the sole authority to accept or reject Work and issue direction for correction, removal, or replacement of Work.

3.2.2 **Clarifications and Interpretations.** It may be determined that clarifications or interpretations of the Contract Documents are necessary. Upon direction by the ODR such clarifications or interpretations will be provided by the A/E consistent with the intent of the Contract Documents. The A/E will issue these clarifications with reasonable promptness to the Contractor as Architect’s Supplemental Instruction (ASI) or similar instrument. If Contractor believes that such clarification or interpretation justifies an adjustment in the Contract Sum or the Contract Time, the Contractor shall so notify the Owner in accordance with the provisions of Article 11.

3.2.3 **Limitations on A/E Authority.** The A/E is not responsible for:

3.2.3.1 The Contractor’s means, methods, techniques, sequences, procedures, safety, or programs incident to the Project nor will the A/E supervise, direct, control or have authority over the same.

3.2.3.2 The failure of Contractor to comply with laws and regulations applicable to furnishing or performing the Work.
3.2.3.3 The Contractor’s failure to perform or furnish the Work in accordance with the Contract Documents.

3.2.3.4 Acts or omissions of the Contractor, or of any other person or organization performing or furnishing any of the Work.

3.3 Contractor’s General Responsibilities. The Contractor is solely responsible for implementing the Work in full compliance with all applicable laws and the Contract Documents and shall supervise and direct the Work using the best skill and attention to assure that each element of the Work conforms to the Contract requirements. The Contractor is solely responsible for all construction means, methods, techniques, safety, sequences, coordination and procedures. The Contractor is responsible for having visited the Site and having ascertained all pertinent local conditions such as existing subsurface concealed conditions, location, accessibility and general character of the Site or building, the character and extent of existing work, the character and extent of existing work within adjacent sites, and any other work being performed thereon at the time Contractor’s bid or proposal is submitted.

3.3.1 Project Administration. The Contractor shall provide project administration for all Subcontractors, vendors, suppliers, and others involved in implementing the Work and shall coordinate administration efforts with those of the A/E and ODR in accordance with these Uniform General and Supplementary Conditions and provisions of Division 1 Specifications, and as outlined in the Pre-construction Conference.

3.3.2 Contractor’s Superintendent. The Contractor shall employ a competent resident Superintendent who will be present at the Project Site during the progress of the Work. The Superintendent is subject to the approval of the ODR. The Contractor shall not change approved Superintendents during the course of the Project without the written approval of the ODR unless the Superintendent leaves the employ of the Contractor.

3.3.3 Labor. The Contractor shall provide competent, suitably qualified personnel to survey, lay-out, and construct the Work as required by the Contract Documents, and maintain good discipline and order at the Site at all times.

3.3.4 Services, Materials, and Equipment. Unless otherwise specified, the Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other
facilities, incidentals, and services necessary for the construction, performance, testing, start-up, inspection and completion of the Work.

3.3.5 **Non-Compliant Work.** Should the A/E and/or the ODR identify Work as non-compliant with the Contract Documents, the ODR will communicate the finding to the Contractor and the Contractor will correct such Work at its expense. The approval of Work by either the A/E or ODR does not relieve the Contractor from the obligation to comply with all requirements of the Contract Documents.

3.3.6 **Subcontractors.** The Contractor shall not employ any Subcontractor, supplier or other person or organization, whether initially or as a substitute, against whom the Owner may have reasonable objection. The Owner will communicate such objections in writing. The Contractor is not required to employ any Subcontractor, supplier or other person or organization to furnish any of the work to whom the Contractor has reasonable objection. The Contractor will not substitute Subcontractors without the acceptance of the Owner.

3.3.6.1 All Subcontracts and supply contracts shall be consistent with and bound to the terms and conditions of the Contract Documents including provisions of the agreement between the Contractor and the Owner.

3.3.6.2 The Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with the Contractor. The Contractor shall require all Subcontractors, suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with Owner only through the Contractor. The Contractor shall furnish to the Owner a copy of each first-tier subcontract promptly after its execution. The Contractor agrees that the Owner has no obligation to review or approve the content of such contracts and that providing the Owner such copies in no way relieves the Contractor of any of the terms and conditions of the Contract, including, without limitation, any provisions of the Contract which require the Subcontractor to be bound to the Contractor in the same manner in which the Contractor is bound to the Owner.

3.3.7 **Continuing the Work.** The Contractor shall carry on the Work and adhere to the progress schedule during all disputes, disagreements or alternative resolution processes with the Owner. The Contractor
shall not delay or postpone any Work because of the pending resolution of any disputes, disagreements or processes, except as the Owner and the Contractor may agree in writing.

3.3.8 **Cleaning.** At all times, the Contractor shall keep the Site and the Work clean and free from accumulation of waste materials or rubbish caused by the construction activities under the Contract. The Contractor shall ensure that the entire Project is thoroughly cleaned prior to requesting Substantial Completion Inspection and, again, upon completion of the Project prior to the Final Completion Inspection.

3.3.9 **Acts and Omissions of Contractor, its Subcontractors and Employees.** The Contractor is responsible for acts and omissions of its employees and all its Subcontractors, their agents and employees. The Owner may, in writing, require the Contractor to remove from the Project any of Contractor’s or its Subcontractor’s employees that the ODR finds to be careless, incompetent, or otherwise objectionable.

3.3.10 **Indemnification of Owner.** The Contractor covenants and agrees to FULLY INDEMNIFY and HOLD HARMLESS, the Owner and the employees, officers, Regents, volunteers, and representatives of the Owner, individually or collectively, from and against any and all costs, claims, liens, damages, losses, expenses, fees, fines, penalties, proceedings, actions, demands, causes of action, liability and suits of any kind and nature, including but not limited to, personal or bodily injury, death and property damage, made upon the Owner directly or indirectly arising out of, resulting from or related to Contractor’s activities under this Contract, including any acts or omissions of Contractor, any agent, officer, director, representative, employee, consultant or Subcontractor of Contractor, and their respective officers, agents, employees, directors and representatives while in the exercise of performance of the rights or duties under this Contract. The indemnity provided for in this paragraph does not apply to any liability resulting from the negligence of the Owner, its officers or employees, separate contractors or assigned contractors, in instances where such negligence causes personal injury, death or property damage. IN THE EVENT CONTRACTOR AND OWNER ARE FOUND JOINTLY LIABLE BY A COURT OF COMPETENT JURISDICTION, LIABILITY WILL BE APPORTIONED COMPARATIVELY IN ACCORDANCE WITH THE LAWS OF THE STATE OF TEXAS, WITHOUT WAIVING ANY GOVERNMENTAL IMMUNITY AVAILABLE TO THE STATE UNDER TEXAS LAW AND WITHOUT WAIVING ANY DEFENSES OF THE PARTIES UNDER TEXAS LAW.
3.3.10.1 The provisions of this indemnification are solely for the benefit of the parties hereto and not intended to create or grant any rights, contractual or otherwise, to any other person or entity.

3.3.10.2 The Contractor shall promptly advise the Owner in writing of any claim or demand against the Owner or the Contractor known to the Contractor related to or arising out of the Contractor’s activities under this Contract.

3.3.11 Ancillary Areas. The Contractor shall operate and maintain operations and associated storage areas at the Site of the Work in accordance with the following:

3.3.11.1 The Contractor shall confine all Contractor operations, including storage of materials and employee parking upon the Site of the Work, to areas designated by the Owner.

3.3.11.2 The Contractor may erect, at its own expense, temporary buildings that will remain its property. The Contractor shall remove such buildings and associated utility service lines upon completion of the Work, unless the Contractor requests and the Owner provides written consent that it may abandon such buildings and utilities in place.

3.3.11.3 The Contractor shall use only established roadways or construct and use such temporary roadways as may be authorized by the Owner. The Contractor shall not allow load limits of vehicles to exceed the limits prescribed by appropriate regulations or law. The Contractor shall provide protection to road surfaces, curbs, sidewalks, trees, shrubbery, sprinkler systems, drainage structures and other like existing improvements to prevent damage, and shall repair any damage, thereto at the expense of the Contractor.

3.3.11.4 The Owner may restrict the Contractor's entry to the Site to specifically assigned entrances and routes.

3.3.12 Separate Contracts. Additional Contractor responsibilities when the Owner awards separate contracts:

3.3.12.1 The Owner reserves the right to award other contracts in connection with other portions of the Project under these or similar contract conditions.
3.3.12.2 The Owner reserves the right to perform operations related to the Project with the Owner's own forces.

3.3.12.3 Under a system of separate contracts, the conditions described herein continue to apply except as may be amended by Change Order.

3.3.12.4 The Contractor shall cooperate with other contractors employed on the Project by the Owner, including providing access to the Site and project information as requested.

Article 4. Historically Underutilized Business (HUB) Subcontracting Plan

4.1. General Description. The purpose of the HUB Program is to promote full and equal business opportunities for all businesses in State contracting.

In accordance with 34 TAC §20.14(d)(1)(D)(iii), a respondent (prime contractor) may demonstrate good faith effort to utilize Texas certified HUBs for its subcontracting opportunities if the total value of the respondent’s subcontracts with Texas certified HUBs meets or exceeds the statewide HUB goal or the agency specific HUB goal, whichever is higher. When a respondent uses this method to demonstrate good faith effort, the respondent must identify the HUBs with which it will subcontract. If using existing contracts with Texas certified HUBs to satisfy this requirement, only contracts that have been in place for five years or less shall qualify for meeting the HUB goal. This limitation is designed to encourage vendor rotation as recommended by the 2009 Texas Disparity Study.

The Texas A&M University System has determined that the agency's goals are higher than the State's goals. Therefore, respondents are required to use the following: 11.2% for heavy construction other than building contracts; 21.1% for all building construction, including general contractors and operative builders contracts; 21.55% for all special trade construction contracts; 32.07% for professional services contracts; 12.63% for all other services contracts; and 52.78% for commodities contracts.

4.1.1 State agencies are required by statute to make a good faith effort to assist HUBs in participating in contract awards issued by the State. 34 TAC §20.11-20.28, outline the State's policy to encourage outreach to and potential utilization of HUBs in state contracting opportunities through race, ethnic and gender neutral means.
4.1.2 A contractor who contracts with the State in an amount of $100,000 or more is required to make a good faith effort to award subcontracts to HUBs in accordance with 34 TAC §20.14 by submitting a HUB Subcontracting Plan at the time of bidding and complying with the HUB Subcontracting Plan after it is accepted by the Owner and during the term of the contract.

4.2. Compliance with Approved HUB Subcontracting Plan. Contractor, having been awarded the Contract in part by complying with the HUB Program statute and rules, hereby covenants to continue to comply with the HUB Program as follows:

4.2.1 Prior to substituting a Subcontractor, promptly notify the Owner in the event a change is required for any reason to the accepted HUB Subcontracting Plan.

4.2.2 Conduct the good faith effort activities required and provide the Owner with necessary documentation to justify approval of a change to the approved HUB Subcontracting Plan.

4.2.3 Cooperate in the execution of a Change Order or such other approval of the change in the HUB Subcontracting Plan as the Contractor and Owner may agree to.

4.2.4 Maintain and make available to Owner upon request business records documenting compliance with the accepted HUB Subcontracting Plan.

4.2.5 Upon receipt of payment for performance of Work, submit to Owner a compliance report, in the format required by the Owner that demonstrates Contractor's performance of the HUB Subcontracting Plan.

4.2.6 Promptly and accurately explain and provide supplemental information to Owner to assist in the Owner's investigation of the Contractor's good faith effort to fulfill the HUB Subcontracting Plan and the requirements under 34 TAC §20.14.

4.3. Failure to Demonstrate Good Faith Effort. Upon a determination by Owner that Contractor has failed to demonstrate a good faith effort to fulfill the HUB Subcontracting Plan or any contract covenant detailed above, the Owner may, in addition to all other remedies available to it, report the failure to perform to the Texas Procurement and Support Services under its Vendor Performance and Debarment Program and may bar the Contractor from future contracting opportunities with the Owner.
Article 5. Bonds & Insurance

5.1. **Construction Bonds.** The Contractor is required to tender to Owner, prior to commencing the Work, performance and payment bonds, as required by Tex. Gov’t Code, Chapter 2253.

5.1.1. **Performance Bond.** A Performance Bond is required if the Contract Sum is in excess of $100,000. The Performance Bond is solely for the protection of the Owner. The Performance Bond is to be for the Contract Sum to guarantee the faithful performance of the Work in accordance with the Contract Documents. The form of the bond shall be approved by the Attorney General of Texas. The Performance Bond shall be effective through the Contractor’s warranty period.

5.1.2. **Payment Bond.** A Payment Bond is required if the Contract Sum is in excess of $25,000. The Payment Bond is to be for the Contract Sum and is payable to the Owner solely for the protection and use of payment bond beneficiaries who have a direct contractual relationship with the Contractor or a Subcontractor. The form of the bond shall be approved by the Attorney General of Texas.

5.1.3. **Bond Requirements.** Each bond shall be executed by a corporate surety or sureties authorized to do business in the State of Texas and acceptable to the Owner, on the Owner’s form, and in compliance with the relevant provisions of the Texas Insurance Code. If any bond is for more than 10 percent of the surety’s capital and surplus, the Owner may require certification that the company has reinsured the excess portion with one or more reinsurers authorized to do business in the State. A reinsurer may not reinsure for more than 10 percent of its capital and surplus. If a surety upon a bond loses its authority to do business in the State, the Contractor shall, within thirty (30) days after such loss, furnish a replacement bond at no added cost to the Owner.

5.1.4. **Power of Attorney.** Each bond shall be accompanied by a valid power-of-attorney issued by the surety company, attached to the bond, and signed and sealed with the corporate embossed seal, authorizing the attorney in fact who signs the bond to commit the surety to the terms of the bond, and stating any limit in the amount for which the attorney can issue a single bond.

5.1.5. **Bond Indemnification.** The process of requiring and accepting bonds and making claims thereunder shall be conducted in compliance with Tex. Gov’t Code, Chapter 2253. IF FOR ANY REASON A STATUTORY PAYMENT OR PERFORMANCE BOND IS NOT
HONORED BY THE SURETY, THE CONTRACTOR SHALL FULLY INDEMNIFY AND HOLD THE OWNER HARMLESS OF AND FROM ANY COSTS, LOSSES, OBLIGATIONS OR LIABILITIES IT INCURS AS A RESULT.

5.1.6. Furnishing Bond Information. Owner shall furnish certified copies of the Payment Bond and the related Contract to any qualified person seeking copies who complies with Tex. Gov’t Code, § 2253.026.

5.1.7. Claims on Payment Bonds. Claims on Payment Bonds must be sent directly to the Contractor and his surety in accordance with Tex. Gov’t Code § 2253.041. All Payment Bond claimants are cautioned that no lien exists on the funds unpaid to the Contractor on such Contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or his surety. The Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no such responsibility because of any representation by any agent or employee.

5.1.8. Payment Claims when Payment Bond not Required. The rights of Subcontractors regarding payment are governed by Tex. Prop. Code, §§53.231 – 53.239 when the value of the Contract between the Owner and the Contractor is less than $25,000.00. These provisions set out the requirements for filing a valid lien on funds unpaid to the Contractor as of the time of filing the claim, actions necessary to release the lien and satisfaction of such claim.

5.1.9. Sureties. Sureties shall be listed on the US Department of the Treasury’s Listing of Approved Sureties stating companies holding Certificates of Authority as acceptable sureties on Federal Bonds and acceptable reinsuring companies (Department Circular 570) and have a rating of A- or better with A.M. Best Company.

5.2. Insurance Requirements.

The Contractor shall carry insurance in the types and amounts indicated in this Article for the duration of the Contract. The required insurance shall include coverage for Owner’s property in the care, custody and control of Contractor prior to construction, during construction and during the warranty period. The insurance shall be evidenced by delivery to the Owner of certificates of insurance executed by the insurer or its authorized agent stating coverages, limits, expiration dates and compliance with all applicable required provisions. Upon request, the Owner, and/or its agents, shall be entitled to receive without expense, copies of the policies and all endorsements. The Contractor shall update all expired policies prior to
submission for monthly payment. Failure to update policies shall be reason for withholding of payment until renewal is provided to the Owner.

5.2.1 The Contractor shall provide and maintain the insurance coverage with the minimum amounts described below until the end of the warranty period unless otherwise stated in Special Conditions. Failure to maintain insurance coverage, as required, is grounds for Suspension of Work for Cause pursuant to Article 14. The Contractor will be notified of the date on which the Builder’s Risk insurance policy may be terminated through Substantial Completion notices, acceptance notices and/or other means as deemed appropriate by the Owner.

5.2.2 Coverage shall be written on an occurrence basis by companies authorized and admitted to do business in the State of Texas or eligible surplus lines insurers operating in accordance with the Texas Insurance Code and have a financial strength rating of A- or better and a financial strength rating of VII or better as measured by A.M. Best Company or otherwise acceptable to Owner, and shall include:

5.2.2.1 Workers’ Compensation Insurance with limits as required by the Texas Workers’ Compensation Act, with the policy endorsed to provide a waiver of subrogation as to the Owner, and Employer’s Liability insurance of not less than:

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Limit</th>
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<tbody>
<tr>
<td>Statutory Benefits (Coverage A)</td>
<td>Statutory</td>
</tr>
<tr>
<td>Statutory</td>
<td>$1,000,000 Each Accident</td>
</tr>
<tr>
<td>Employers Liability (Coverage B)</td>
<td>$1,000,000 Disease/Employee</td>
</tr>
<tr>
<td>Disease/Policy Limit</td>
<td>$1,000,000 Disease/Policy Limit</td>
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</table>

Workers’ Compensation policy must include under Item 3.A. on the information page of the workers’ compensation policy the state in which work is to be performed for the Owner. No ‘alternative’ form of insurance will be permitted.

5.2.2.2 Commercial General Liability Insurance, including Independent Contractor’s liability, Products and Completed Operations and Contractual Liability, covering, but not limited to, the liability assumed under the indemnification provisions of this Contract, fully insuring Contractor’s (or Subcontractors) liability for bodily injury and property damage with a combined bodily injury (including death) and property damage minimum limit of:
$1,000,000 per occurrence  
$2,000,000 general aggregate  
$1,000,000 products and completed operations aggregate  
$1,000,000 personal/advertising injury  
$300,000 damage to rented premises  
$5,000 medical payments Coverage

shall be on an "occurrence" basis.

The policy shall include coverage extended to apply to completed operations and explosion, collapse, and underground hazards. The policy shall include endorsement CG2503 Amendment-Aggregate Limits of Insurance (Per Project) or its equivalent.

5.2.2.3 Asbestos Abatement Liability Insurance, including coverage for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos containing materials. *This requirement applies if the Work or the Project includes asbestos containing materials.

The combined single limit for bodily injury and property damage will be a minimum of $1,000,000 per occurrence.

*Specific Requirement for Claims-Made Form: Required period of coverage will be determined by the following formula: Continuous coverage for life of the Contract, plus one (1) year (to provide coverage for the warranty period), and an extended discovery period for a minimum of five (5) years which shall begin at the end of the warranty period.

If this Contract is for asbestos abatement only, the All-Risk Builder's Risk or All-Risk Installation Floater (e) is not required.

5.2.2.4 Comprehensive Automobile Liability Insurance, covering owned, hired, and non-owned vehicles, with a combined bodily injury (including death) and property damage minimum limit of $1,000,000 per occurrence. No aggregate shall be permitted for this type of coverage.

Such insurance is to include coverage for loading and unloading hazards.

5.2.2.5 All Risk Builder's Risk Insurance (or All Risk Installation Floater for instances in which the Project involves solely the
installation of equipment). Coverage shall be All-Risk, including, but not limited to, Fire, Extended Coverage, Vandalism and Malicious Mischief, Flood, Earthquake, Theft and damage resulting from faulty workmanship, design or materials. If Builder’s Risk, limit shall be equal to 100 percent of the Contract. If Installation Floater, limit shall be equal to 100 percent of the contract cost. The policy shall be written jointly in the names of the Owner, the Contractor, Subcontractors and, Subcontractors shall be named as additional insured. The policy shall have endorsements as follows:

5.2.2.5.1 This insurance shall be specific as to coverage and not contributing insurance with any permanent insurance maintained on the property.

5.2.2.5.2 This insurance shall not contain an occupancy clause suspending or reducing coverage should the Owner occupy, or begin beneficial occupancy before the Owner has accepted final completion.

5.2.2.5.3 Loss, if any, shall be adjusted with and made payable to the Owner as Trustee for the insureds as their interests may appear; the right of subrogation under the Builder’s Risk policy shall be waived as to the Owner. The Owner shall be named as Loss Payee. For renovation projects or projects that involve portions of work contained within an existing structure, refer to Special Conditions for possible additional Builder’s Risk insurance requirements.

5.2.2.6 "Umbrella" Liability Insurance. The Contractor shall obtain, pay for and maintain umbrella liability insurance during the contract term, insuring the Contractor (or Subcontractor) for an amount of not less than the amount specified in the Special Conditions that provides coverage at least as broad as and applies in excess and follows form of the primary liability coverages required hereinabove. The policy shall provide "drop down" coverage where underlying primary insurance coverage limits are insufficient or exhausted.

If the Contract is for asbestos abatement only, the "Umbrella" Excess Liability is not required.

5.2.3 Policies must include the following clauses, as applicable:
5.2.3.1 This insurance shall not be canceled, materially changed, or non-renewed until after thirty (30) days prior written notice has been given to the Owner.

5.2.3.2 It is agreed that the Contractor's insurance shall be deemed primary with respect to any insurance or self insurance carried by the Owner for liability arising out of operations under the Contract with the Owner.

5.2.3.3 The Owner, its officials, directors, employees, representatives, and volunteers are added as additional insureds as respects operations and activities of, or on behalf of the named insured performed under contract with the Owner. The additional insured status must cover completed operations as well. This is not applicable to the workers' compensation policy.

5.2.3.4 The workers' compensation and employers' liability policy will provide a waiver of subrogation in favor of the Owner.

5.2.4 Without limiting any of the other obligations or liabilities of the Contractor, the Contractor shall require each Subcontractor performing work under the Contract, at the Subcontractor's own expense, to maintain during the term of the Contract, the same stipulated minimum insurance including the required provisions and additional policy conditions as shown above. As an alternative, the Contractor may include its Subcontractors as additional insureds on its own coverage as prescribed under these requirements. The Contractor's certificate of insurance shall note in such event that the Subcontractors are included as additional insureds and that Contractor agrees to provide Workers' Compensation for the Subcontractors and their employees. The Contractor shall obtain and monitor the certificates of insurance from each Subcontractor in order to assure compliance with the insurance requirements. The Contractor must retain the certificates of insurance for the duration of the Contract plus 5 years and shall have the responsibility of enforcing these insurance requirements among its Subcontractors. The Owner shall be entitled, upon request and without expense, to receive copies of these certificates.

5.2.5 Workers' Compensation Insurance Coverage must meet the statutory requirements of Tex. Lab. Code, §401.011(44), and those specific to construction projects for public entities as required by Tex. Lab. Code, §406.096.
Article 6. Contract Documents

6.1. **Drawings and Specifications**

6.1.1 **Copies Furnished.** The Contractor will be furnished one (1) digital copy of Drawings and Specifications free of charge.

6.1.2 **Ownership of Drawings and Specifications.** All Drawings, Specifications and copies thereof furnished by the A/E are to remain A/E’s property. These documents are not to be used on any other project, and with the exception of one contract set for each party to the Contract, are to be returned to the A/E, upon request, following completion of the Work.

6.1.3 **Interrelation of Documents.** The Contract Documents as referenced in the agreement between the Owner and the Contractor, are complimentary, and what is required by one shall be as binding as if required by all.

6.1.4 **Resolution of Conflicts in Documents.** Where conflicts may exist between and/or within the Contract Documents, the higher quality, greater quantity, more restrictive, and/or more expensive requirement **shall be required** and shall be the basis of Contractor pricing. The Contractor shall notify the A/E and the ODR for resolution of the issue prior to executing the work in question.

6.1.5 **Contractor’s Duty to Review Contract Documents.** In order to facilitate its responsibilities for completion of the Work in accordance with and as reasonably inferable from the Contract Documents, prior to pricing or commencing the Work, the Contractor shall examine and compare the Contract Documents, information furnished by the Owner, relevant field measurements made by the Contractor and any visible or reasonably anticipated conditions at the Site affecting the Work. This duty extends throughout the construction phase prior to commencing each particular work activity and/or system installation.

6.1.6 **Discrepancies and Omissions in Drawings and Specifications**

6.1.6.1 The Contractor shall promptly report to the ODR and to the A/E the discovery of any apparent error, omission or inconsistency in the Contract Documents prior to execution of the Work.

6.1.6.2 It is recognized that the Contractor is not acting in the capacity of a licensed design professional, unless it is performing as a Design-Build firm.
6.1.6.3. It is further recognized that the Contractor's examination of Contract Documents is to facilitate construction and does not create an affirmative responsibility to detect errors, omissions or inconsistencies or to ascertain compliance with applicable laws, building codes or regulations, unless it is performing as a Design-Build firm.

6.1.6.4 When performing as a Design-Build firm, the Contractor has sole responsibility for discrepancies, errors, and omissions in the Drawings and Specifications.

6.1.6.5 When performing as a Construction Manager-at-Risk, the Contractor has a shared responsibility for discovery and resolution of discrepancies, errors, and omissions in the Contract Documents. In such case, the Contractor's responsibility pertains to review, coordination, and recommendation of resolution strategies within budget constraints, but does not establish a liability for design.

6.1.6.6 The Contractor has no liability for errors, omissions, or inconsistencies in the Drawings and Specifications unless the Contractor knowingly failed to report a recognized problem to the Owner or the Work is executed under a Design-Build contract as outlined above. Should the Contractor fail to perform the examination and reporting obligations of these provisions, the Contractor is responsible for avoidable costs, direct, and/or consequential damages.

6.1.6.7 The Owner makes no representations, express or implied, about the adequacy or accuracy of the Drawings, Specifications or other Construction Documents provided or their suitability for their intended use. Owner expressly disclaims any implied warranty that the Construction Documents are adequate, accurate or suitable for their intended use.

6.2 Requirements for Record Documents.

The Contractor shall maintain at the Site one copy of all Drawings, Specifications, addenda, approved submittals, contract modifications, and all Project correspondence. The Contractor shall keep current and maintain Drawings and Specifications in good order with postings and markings to record actual conditions of Work and show and reference all changes made during construction. The Contractor shall provide Owner and A/E access to these documents.
6.2.1 The Contractor shall maintain the record set of Drawings and Specifications which reflect the "As Constructed" conditions and representations of the Work performed, whether it be directed by addendum, Change Order or otherwise. The Contractor shall make available all records prescribed herein for reference and examination by the Owner and its representatives and agents.

6.2.2 The Contractor shall update the "As-Constructed" Drawings and Specifications monthly prior to submission of periodic partial pay estimates. Failure to maintain such records constitutes cause for denial of a progress payment otherwise due.

6.2.3 Prior to requesting the Substantial Completion Inspection by the ODR and A/E, the Contractor shall furnish the ODR a complete set of the marked up "As-Constructed" set maintained at the Site and one photocopy of same. Concurrently with furnishing these record drawings, the Contractor shall furnish a preliminary copy of each operating and maintenance manual (O&M) required by the Contract Documents, for review by the A/E and the ODR.

6.2.4 Once determined acceptable, the Contractor shall provide to Owner mylar prints of professionally drafted “As-Constructed” drawings, along with an electronic copy on CD, “As-Constructed” specifications in bound volume(s) along with an electronic copy on CD, two sets of photocopies or prints of the mylar “As-Constructed” drawings, two sets of operating and maintenance manuals, two sets of approved submittals, and other record documents as required elsewhere in the Contract Documents. All electronic copies shall be provided in a format acceptable to the ODR.

Article 7. Safety

7.1. General. It is the duty and responsibility of the Contractor and all of its Subcontractors to be familiar with, enforce and comply with all requirements of Public Law 91-596, 29 U.S.C. §§651 et. seq., the Occupational Safety and Health Act of 1970 (OSHA), and all amendments thereto. The Contractor shall prepare a Safety Plan specific to the Project and submit it to the ODR and A/E prior to commencing Work. In addition, the Contractor and all of its Subcontractors shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property to protect them from damage, injury or loss, and erect and maintain all necessary safeguards for such safety and protection.

7.2. Notices. The Contractor shall provide notices as follows:
7.2.1 Notify owners of adjacent property including those that own or operate utility services and/or underground facilities, and utility owners, when prosecution of the Work may affect them or their facilities, and cooperate with them in the protection, removal, relocation and replacement of their facilities, and with respect to access to their facilities and/or utilities.

7.2.2 Coordinate the exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in connection with laws and regulations. Maintain a complete file of MSDS for all materials in use on Site throughout the construction phase and make such file available to the Owner and its agents as requested.

7.3. **Emergencies.** In any emergency affecting the safety of persons or property, the Contractor shall act to minimize, mitigate, and prevent threatened damage, injury or loss.

7.3.1 Have authorized agents of Contractor respond immediately upon call at anytime of day or night when circumstances warrant the presence of Contractor to protect the Work or adjacent property from damage or to take such action pertaining to the Work as may be necessary to provide for the safety of the public.

7.3.2 Give the ODR and A/E prompt notice of all such events.

7.3.3 If Contractor believes that any changes in the Work or variations from Contract Documents have been caused by its emergency response, promptly notify the Owner within 72 hours of the emergency response event.

7.3.4 Should Contractor fail to respond, Owner is authorized to direct other forces to take action as necessary and Owner may deduct any cost of remedial action from funds otherwise due the Contractor.

7.4. **Injuries.** In the event of an incident or accident involving outside medical care for an individual on or near the Work, Contractor shall notify the ODR and other parties as may be directed within 24 hours of the event.

7.4.1 Record the location of the event and the circumstances surrounding it, by using photography or other means, and gather witness statements and other documentation which describes the event.

7.4.2 Supply the ODR and A/E with an incident report no later than 36 hours after the occurrence of the event. In the event of a catastrophic incident (one fatality or three workers hospitalized), barricade and
leave intact the scene of the incident until all investigations are complete. A full set of incident investigation documents, including facts, finding of cause, and remedial plans shall be provided by Contractor to Owner within one week after occurrence, unless otherwise directed by Owner’s legal counsel. Contractor shall provide the ODR with written notification within one week of such catastrophic event if legal counsel delays submission of a full report.

7.5. Environmental Safety. Upon encountering any previously unknown potentially hazardous material, or other materials potentially contaminated by hazardous material, Contractor shall immediately stop work activities impacted by the discovery, secure the affected area, and notify the ODR immediately.

7.5.1 The Contractor shall bind all Subcontractors to the same duty.

7.5.2 Upon receiving such notice, the ODR will promptly engage qualified experts to make such investigations and conduct such tests as may be reasonably necessary to determine the existence or extent of any environmental hazard. Upon completion of this investigation, the ODR will issue a written report to the Contractor identifying the material(s) found and indicate any necessary steps to be taken to treat, handle, transport or dispose of the material.

7.5.3 The Owner may hire third-party contractors to perform any or all such steps.

7.5.4 Should compliance with the ODR’s instructions result in an increase in the Contractor’s cost of performance, or delay the Work, the Owner will make an equitable adjustment to the Contract Sum and/or the Contract Time, and modify the Contract in writing accordingly.

7.6. Trenching Plan. When the Project requires excavation which either exceeds a depth of four feet, or results in any worker’s upper body being positioned below grade level, the Contractor is required to submit a trenching plan to the ODR prior to commencing trenching operations. The plan is required to be prepared and sealed by a professional engineer registered in the State of Texas, and employed by the Contractor. Said engineer cannot be anyone who is otherwise either directly or indirectly engaged on this Project.

Article 8. Quality Control

8.1. Materials & Workmanship. The Contractor shall execute Work in a good and workmanlike manner in accordance with the Contract Documents. The Contractor shall develop and provide a Quality Control Plan specific to this Project and acceptable to the Owner. Where Contract Documents do not
specify quality standards, the Contractor shall complete and construct all Work in compliance with generally accepted construction industry standards. Unless otherwise specified, the Contractor shall incorporate all new materials and equipment into the Work under the Contract.

8.2. **Testing**

8.2.1 *Contractor Testing*. The Contractor is responsible for coordinating and paying for all routine and special tests required to confirm compliance with quality and performance requirements of the Contract Documents. This “quality control” testing shall include any particular testing required by the Specifications and the following general tests:

8.2.1.1 Any test of basic material or fabricated equipment included as part of a submittal for a required item in order to establish compliance with the Contract Documents.

8.2.1.2 Any test of basic material or fabricated equipment offered as a substitute for a specified item on which a test may be required in order to establish compliance with the Contract Documents.

8.2.1.3 Routine, preliminary, start-up, pre-functional and operational testing of building equipment and systems as necessary to confirm operational compliance with requirements of the Contract Documents.

8.2.1.4 All subsequent tests on original or replaced materials conducted as a result of prior testing failure.

8.2.2 *Owner Testing*. The Owner reserves the right to subject materials and systems incorporated into the Project to routine tests as may be specified or as deemed necessary by the ODR or the A/E to insure compliance with the quality and/or performance requirements of the Contract Documents and/or with laws, ordinances, rules, regulations and/or orders of any public authority having jurisdiction. The results of such “quality assurance” testing will be provided to the Contractor and, to the extent provided, the Contractor may rely on findings.

8.2.3 All testing shall be performed in accordance with standard test procedures by an accredited laboratory, or special consultant as appropriate, acceptable to the Owner. Results of all tests shall be provided promptly to the ODR, A/E and the Contractor.

8.2.4 **Non-Compliance (Test Results)**. Should any of the tests indicate that a material and/or system does not comply with the contract...
requirements, the burden of proving compliance remains with the Contractor. The tests are subject to the following conditions:

8.2.4.1 The Contractor’s selected laboratory must be acceptable to the Owner.

8.2.4.2 The quality and nature of the tests must be acceptable to the Owner.

8.2.4.3 All tests must be taken in the presence of the A/E and/or ODR, or their representatives.

8.2.4.4 If tests confirm that the material/systems comply with Contract Documents, the Owner will pay the cost of the test.

8.2.4.5 If tests reveal noncompliance, the Contractor will pay the laboratory fees and costs of that particular test and all future tests of that failing Work, necessary to eventually confirm compliance with Contract Documents.

8.2.4.6 Proof of noncompliance with the Contract Documents will make the Contractor liable for any corrective action which the ODR determines appropriate, including complete removal and replacement of non-compliant work or material.

8.2.5 Notice of Testing. The Contractor shall give the ODR and the A/E timely notice of its readiness and the date arranged so the ODR and A/E may observe such inspection, testing or approval.

8.2.6 Test Samples. The Contractor is responsible for providing Samples of sufficient size for test purposes and for coordinating such tests with the Work Progress Schedule to avoid delay.

8.2.7 Covering Up Work. If the Contractor covers up any Work without providing the Owner an opportunity to inspect, the Contractor shall, if requested by the ODR, uncover and recover the Work at Contractor’s expense.

8.3 Submittals

8.3.1 Contractor’s Submittals. The Contractor shall submit with reasonable promptness consistent with the Work Project Schedule and in orderly sequence all Shop Drawings, Samples, or other information required by the Contract Documents, or subsequently required by Change Order. Prior to submitting, the Contractor shall review each submittal for compliance with the Contract Documents and certify its approval.
by an approval stamp affixed to each copy. Submittal data presented without the Contractor’s certification will be returned without review or comment, and any delay resulting from such certification is the Contractor’s responsibility.

8.3.1.1 Within twenty-one (21) calendar days of the effective date of the Notice to Proceed with construction, the Contractor shall submit to the ODR, and the A/E, a submittal schedule/register, organized by specification section, listing all items to be furnished for review and approval by the A/E and Owner. The list shall include Shop Drawings, manufacturer’s literature, certificates of compliance, materials samples, materials colors, guarantees, and all other items identified throughout the Specifications.

8.3.1.2 The Contractor shall indicate the type of item, contract requirements reference, and Contractor’s scheduled dates for submitting the item along with the requested dates for approval answers from the A/E and Owner. The submittal register shall indicate the projected dates for procurement of all included items and shall be updated at least monthly with actual approval and procurement dates. The Contractor shall show and allow a minimum of thirty (30) calendar days duration after receipt by the A/E and ODR for review and approval. If re-submittal is required, allow a minimum of an additional fifteen (15) calendar days for review. Submit the updated submittal register with each request for progress payment. The Owner may establish routine review procedures and schedules for submittals at the preconstruction conference and/or elsewhere in the Contract Documents. **Failure to update and provide the submittal schedule/register as required shall constitute cause for Owner to withhold payment otherwise due.**

8.3.1.3 The Contractor shall coordinate the submittal register with the Work Progress Schedule. Do not schedule Work requiring a submittal to begin prior to scheduling review and approval of the related submittal. The Contractor shall revise and/or update both schedules monthly to ensure consistency and current project data. The Contractor shall provide to the ODR the updated submittal register and schedule with each application for progress payment. The Contractor shall refer to the requirements for the Work Progress Schedule for inclusion of procurement activities therein. Regardless, the submittal register shall identify dates submitted and returned and shall be used to confirm status and disposition of
particular items submitted, including approval or other action taken and other information not conveniently tracked through the Work Progress Schedule.

8.3.1.4 By submitting Shop Drawings, Samples or other required information, the Contractor represents and certifies that it has determined and verified all applicable field measurements, field construction criteria, materials, catalog numbers and similar data; and has checked and coordinated each Shop Drawing and Sample with the requirements of the Work and the Contract Documents.

8.3.2 Review of Submittals. A/E and ODR review is only for conformance with the design concept and the information provided in the Contract Documents. Responses to submittals will be in writing. The approval of a separate item does not indicate approval of an assembly in which the item functions. The approval of a submittal does not relieve the Contractor of responsibility for any deviation from the requirements of the Contract unless the Contractor informs the A/E and ODR of such deviation in a clear, conspicuous, and written manner on the submittal transmittal and at the time of submission, and obtains the A/E's and Owner’s written specific approval of the particular deviation.

8.3.3 Correction and Resubmission. The Contractor shall make any corrections required to a submittal and resubmit the required number of corrected copies promptly so as to avoid delay, until submittal approval. When applicable, the Contractor shall direct attention of the A/E and the ODR in writing to any new revisions other than the corrections requested on previous submissions.

8.3.4 Limits on Shop Drawing Approvals. The Contractor shall not commence any Work requiring a submittal until approval of the submittal. The Contractor shall construct all such work in accordance with approved submittals. Approval of Shop Drawings and Samples is not authorization to Contractor to perform extra work or changed work unless authorized through a Change Order. The A/E’s and ODR’s approval, if any, does not relieve Contractor from responsibility for defects in the Work resulting from errors or omissions of any kind on the submittal, regardless of any approval action.

8.3.5 No Substitutions Without Approval. The ODR and the A/E may receive and consider the Contractor’s request for substitution when the Contractor agrees to reimburse the Owner for review costs and satisfies 8.3.5.1, 8.3.5.2, and 8.3.5.3 in combination with one or more
of the items in 8.3.5.4 through 8.3.5.11 of the following conditions, as
determined by the Owner. If the Contractor does not satisfy these
conditions, the ODR and A/E will return the request without action
except to record noncompliance with these requirements. The Owner
will not consider the request if the Contractor cannot provide the
product or method because of failure to pursue the Work promptly or
coordinate activities properly.

8.3.5.1 The Contract Documents do not require extensive
revisions.

8.3.5.2 Proposed changes are in keeping with the general intent of
the Contract Documents and the design intent of the A/E
and do not result in an increase in cost to the Owner.

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

8.3.5.4 The Contractor cannot provide the specified product,
assembly or method of construction within the Contract
Time.

8.3.5.5 The request directly relates to an "or-equal" clause or similar
language in the Contract Documents.

8.3.5.6 The request directly relates to a "product design standard"
or "performance standard" clause in the Contract
Documents.

8.3.5.7 The requested substitution offers the Owner a substantial
advantage in cost, time, energy conservation or other
considerations, after deducting additional responsibilities the
Owner must assume.

8.3.5.8 The specified product or method of construction cannot
receive necessary approval by an authority having
jurisdiction, and the ODR can approve the requested
substitution.

8.3.5.9 The Contractor cannot provide the specified product,
assembly or method of construction in a manner that is
compatible with other materials and the Contractor certifies
that the substitution will overcome the incompatibility

8.3.5.10 The Contractor cannot coordinate the specified product,
assembly or method of construction with other materials
and the Contractor certifies it can coordinate the proposed substitution.

8.3.5.11 The specified product, assembly or method of construction cannot provide a warranty required by the Contract Documents and the Contractor certifies that the proposed substitution provides the required warranty.

8.3.6 Unauthorized Substitutions at Contractor's Risk. The Contractor is financially responsible for any additional costs or delays resulting from using materials, equipment or fixtures other than those specified. The Contractor shall reimburse the Owner for any increased design or contract administration costs resulting from such unauthorized substitutions.

8.4 Field Mock-up.

8.4.1 Mock-ups shall be constructed prior to commencement of a specified scope of work to confirm acceptable workmanship.

8.4.1.1 As a minimum, field mock-ups shall be constructed for roofing systems, exterior veneer/finish systems, glazing systems, and any other Work requiring a mock-up as identified throughout the Contract Documents. Mock-ups for systems not part of the project scope shall not be required.

8.4.1.2 Mock-ups may be incorporated into the Work if allowed by the Contract Documents and if acceptable to the ODR. If mock-ups are freestanding, they shall remain in place until otherwise directed by the Owner.

8.4.1.3 The Contractor shall include field mock-ups in their Work Progress Schedule and shall notify the ODR and A/E of readiness for review sufficiently in advance to coordinate review without delay.

8.5 Inspection During Construction.

8.5.1 The Contractor shall provide sufficient, safe, and proper facilities, including equipment, as necessary for safe access at all reasonable times for observation and/or inspection of the Work by the Owner and its agents.

8.5.2 The Contractor shall not cover up any work with finishing materials or other building components prior to providing the Owner and its agents an opportunity to perform an inspection of the Work.
8.5.2.1 Should corrections of the Work be required for approval, the Contractor shall not cover up corrected Work until the Owner indicates approval.

8.5.2.2 The Contractor shall provide notification of at least five (5) working days or otherwise as mutually agreed, to the ODR of the anticipated need for a cover-up inspection. Should the ODR fail to make the necessary inspection within the agreed period, the Contractor may proceed with cover up Work, but is not relieved of responsibility for Work to comply with requirements of the Contract Documents.

Article 9. Construction Schedules

9.1. Contract Time. TIME IS AN ESSENTIAL ELEMENT OF THE CONTRACT. The Contract Time is the time between the dates indicated in the Notice to Proceed for the Date of Commencement (Start Date) and for achieving Substantial Completion. The Contract Time can be modified only by Change Order. Failure to achieve Substantial Completion within the Contract Time, and Final Completion within thirty (30) days following Substantial Completion or as otherwise agreed to in writing will cause damage to the Owner and may subject the Contractor to Liquidated Damages as provided in Article 9.11.

9.2. Notice to Proceed. The Owner will issue a Notice to Proceed which shall state the dates for beginning Work (the Date of Commencement) and for achieving Substantial Completion and Final Completion of the Work.

9.3. Work Progress Schedule. Refer to Special Conditions and Division 1 General Administration Specifications for additional schedule requirements. Unless indicated otherwise in those documents, Contractor shall submit to the ODR and the A/E its initial Work Progress Schedule for the Work in relation to the entire Project not later than twenty-one (21) days after the effective date of the Notice to Proceed. Unless otherwise indicated in the Contract Documents, the Work Progress Schedule shall be based upon a computerized Critical Path Method (CPM) with full reporting capability. This initial schedule shall indicate the dates for starting and completing the various aspects required to complete the Work, including mobilization, procurement, installation, testing, inspection, and acceptance of all the Work of the Contract. When acceptable to the Owner, the initially accepted schedule shall be the Baseline Schedule for comparison to actual conditions throughout the contract duration.

9.3.1 Schedule Requirements. The Contractor shall submit an electronic and a paper copy of the initial Work Progress Schedule reflecting
accurate and reliable representations of the planned progress of the Work, the Work to date if any, and of the Contractor’s actual plans for its completion. The Contractor shall organize and provide adequate detail so the Work Progress Schedule is capable of measuring and forecasting the effect of delaying events on completed and uncompleted activities.

9.3.1.1 The Contractor shall re-submit initial Schedule as required to address review comments from A/E and ODR until such Schedule is accepted as the Baseline Schedule.

9.3.1.2 Submittal of a schedule, schedule revision or schedule update constitutes the Contractor's representation to the Owner of the accurate depiction of all progress to date and that the Contractor will follow the schedule as submitted in performing the Work.

9.3.2 Schedule Updates. The Contractor shall update the Work Progress Schedule and the Submittal Schedule monthly, as a minimum, to reflect progress to date and current plans for completing the Work, and submit a paper and electronic copy of the update to the A/E and ODR as directed. The Owner has no duty to make progress payments unless accompanied by the updated Work Progress Schedule. The Contractor shall show the anticipated date of completion reflecting all extensions of time granted through Change Order as of the date of the update. The Contractor may revise the Progress Schedule logic only with the Owner's concurrence when in the Contractor's judgment it becomes necessary for the management of the Work. The Contractor shall identify all proposed changes to the schedule logic to the Owner and to the A/E via an Executive Summary accompanying the updated schedule for review prior to implementation of revisions.

9.3.3 The Work Progress Schedule is for the Contractor's use in managing the Work, and submittal of the Schedule and successive updates or revisions, is for the information of the Owner and to demonstrate that the Contractor has complied with requirements for planning the Work. The Owner's acceptance of a schedule, schedule update or revision, constitutes the Owner's agreement to coordinate its own activities with the Contractor's activities as shown on the schedule.

9.3.3.1 Acceptance of the Work Progress Schedule, or an update and/or revision thereto does not indicate any approval of the Contractor's proposed sequences and duration.
9.3.3.2 Acceptance of a Work Progress Schedule update or revision indicating early or late completion does not constitute the Owner's consent, alter the terms of the Contract, or waive either the Contractor's responsibility for timely completion or the Owner's right to damages for the Contractor's failure to do so.

9.3.3.3 The Contractor's scheduled dates for completion of any activity or the entire Work do not constitute a change in terms of the Contract. Change Orders are the only method of modifying the completion date(s) and Contract Time.

9.4. Ownership of Float. Unless indicated otherwise in the Contract Documents, the Contractor shall develop the Work Progress Schedule and its execution plan to provide a minimum of 10 percent total float at the project level at acceptance of the Baseline Schedule. Float time contained in the Work Progress Schedule is not for the exclusive benefit of the Contractor or the Owner, but belongs to the Project and may be consumed by either party as needed on a first-used basis.

9.5. Completion of Work. The Contractor is accountable for completing the Work in the time stated in the Contract, or as otherwise amended by Change Order.

9.5.1f, in the judgment of the Owner, the work is behind schedule and the rate of placement of work is inadequate to regain scheduled progress to insure timely completion of the entire Work or a separable portion thereof, the Contractor, when so informed by the Owner, shall immediately take action to increase the rate of work placement by:

9.5.1.1 An increase in working forces.

9.5.1.2 An increase in equipment or tools.

9.5.1.3 An increase in hours of work or number of shifts.

9.5.1.4 Expediting delivery of materials.

9.5.1.5 Other action proposed if acceptable to Owner.

9.5.2 Within ten (10) calendar days after such notice from the ODR, the Contractor shall notify the ODR in writing of the specific measures taken and/or planned to increase the rate of progress. The Contractor shall include an estimate as to the date of scheduled progress recovery and an updated Work Progress Schedule illustrating the Contractor's plan for achieving timely completion of the
Project. Should the ODR deem the plan of action inadequate, the Contractor shall take additional steps or make adjustments as necessary to its plan of action until it meets with the ODR’s approval.

9.6 Modification of the Contract Time

9.6.1 Delays and extension of time as hereinafter described are valid only if executed in accordance with provisions set forth in Article 11.

9.6.2 When a delay defined herein as excusable prevents the Contractor from completing the Work within the Contract Time, the Contractor is entitled to an extension of time. The Owner will make an equitable adjustment and extend the number of calendar days lost because of excusable delay, as measured by the Contractor’s progress schedule. All extensions of time will be granted in calendar days. In no event, however, will an extension of time be granted for delays that merely extend the duration of non-critical activities, or which only consume float without delaying the project completion date.

9.6.2.1 “A Weather Day” is a day on which the Contractor’s current schedule indicates Work is to be done, and on which inclement weather and related site conditions prevent the Contractor from performing seven continuous hours of Work between the hours of 7:00 a.m. and 6:00 p.m. Weather days are excusable non-compensatory delays. When weather conditions at the Site prevent Work from proceeding, the Contractor shall immediately notify the ODR for confirmation of the conditions. At the end of each calendar month, the Contractor shall submit to the ODR and A/E a list of Weather Days occurring in that month along with documentation of the impact on critical activities. Based on confirmation by the ODR, any time extension granted will be issued by Change Order for those weather days during that month which exceed the number expected, as shown in the Rainfall Table located in Special Conditions. If the Contractor and Owner cannot agree on the time extension, the Owner may issue a Unilateral Change Order for a fair and reasonable time extension.

9.6.2.2 Excusable Delay. The Contractor is entitled to an equitable adjustment of time, issued via Change Order, for delays caused by the following:

9.6.2.2.1 Errors, omissions and imperfections in design which the A/E corrects by means of changes in the Drawings and Specifications.
9.6.2.2 Unanticipated physical conditions at the Site which the A/E corrects by means of changes to the Drawings and Specifications or for which the ODR directs changes in the Work identified in the Contract Documents.

9.6.2.3 Changes in the Work that affect activities identified in the Contractor's schedule as "critical" to completion of the entire Work, if such changes are ordered by the ODR or the A/E.

9.6.2.4 Suspension of Work for unexpected natural events (sometimes called "acts of God"), civil unrest, strikes or other events which are not within the reasonable control of the Contractor.

9.6.2.5 Suspension of Work for convenience of the ODR, which prevents Contractor from completing the Work within the Contract Time.

9.6.3 The Contractor's relief in the event of such delays is the time impact to the critical path as determined by analysis of the Contractor's schedule. In the event that the Contractor incurs additional direct costs because of the delay, they are to be determined pursuant to the provisions of Article 11.

9.7 **No Damages for Delay.** The Contractor has no claim for monetary damages for delay or hindrances to the Work from any cause, including without limitation any act or omission of the Owner.

9.8 **Concurrent Delay.** When the completion of the Work is simultaneously delayed by an excusable delay and a delay arising from a cause not designated as excusable, the Contractor may not be entitled to a time extension for the period of concurrent delay.

9.9 **Other Time Extension Requests.** Time extensions requested in association with changes to the Work directed or requested by the Owner shall be included with the Contractor's proposed costs for such change. Time extensions requested for inclement weather are covered by paragraph 9.6.2.1 above. If the Contractor believes that the completion of the Work is delayed by a circumstance other than for changes directed to the Work or weather, it shall give the ODR written notice, stating the nature of the delay and the activities potentially affected, within five (5) calendar days after the onset of the event or circumstance giving rise to the delay. The Contractor shall provide sufficient written evidence to document the delay. In the case
of a continuing cause of delay, only one notice of delay is necessary. The Contractor shall state claims for extensions of time in numbers of whole or half calendar days.

9.9.1 Within ten (10) calendar days after the cessation of the delay, the Contractor shall formalize its request for extension of time in writing to include a full analysis of the impact of the delay on the Work Progress Schedule and substantiation of the excusable nature of the delay. All changes to the Contract Time or made as a result of such claims is by Change Order, as set forth in Article 11.

9.9.2 No extension of time releases the Contractor or the Surety furnishing a performance or payment bond from any obligations under the Contract or such bond. Those obligations remain in full force until the discharge of the Contract.

9.9.3 Contents of Time Extension Requests. The Contractor shall provide with each time extension request a quantitative demonstration of the impact of the delay on project completion time, based on the Work Progress Schedule. The Contractor shall include with Time Extension Requests a reasonably detailed narrative setting forth:

9.9.3.1 The nature of the delay and its cause; the basis of the Contractor’s claim of entitlement to a time extension.

9.9.3.2 Documentation of the actual impacts of the claimed delay on the critical path indicated in the Contractor’s Work Progress Schedule, and any concurrent delays.

9.9.3.3 Description and documentation of steps taken by the Contractor to mitigate the effect of the claimed delay, including, when appropriate, the modification of the Work Progress Schedule.

9.9.4 Owner’s Response. The Owner will respond to the Time Extension Request by providing to the Contractor written notice of the number of days granted, if any, and giving its reason if this number differs from the number of days requested by the Contractor.

9.9.4.1 The Owner will not grant time extensions for delays that do not affect the Contract Completion Date.

9.9.4.2 The Owner will respond to each properly submitted Time Extension Request within fifteen (15) calendar days following receipt. If the Owner cannot reasonably make a determination about the Contractor’s entitlement to a time
extension within that time, the Owner will notify the Contractor in writing. Unless otherwise agreed by the Contractor, the Owner has no more than fifteen (15) additional calendar days to prepare a final response. If the Owner fails to respond within forty-five (45) calendar days from the date the Time Extension Request is received, the Contractor is entitled to a time extension in the amount requested.

9.10 Failure to Complete Work Within the Contract Time. **TIME IS OF THE ESSENCE OF THIS CONTRACT.** The Contractor’s failure to substantially complete the Work within the Contract Time or to achieve Final Completion as required will cause damage to the Owner. These damages are liquidated by agreement of the Contractor and the Owner, as set forth in Article 9.11 below.

9.11 Liquidated Damages. For each consecutive calendar day after the date of Substantial Completion, plus any extensions of time granted by Change Order, that the Work is not substantially completed, Contractor shall pay to Owner, within ten (10) days following written demand, an amount determined by the following schedule:

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<th>AACC</th>
<th>Liquidated Damages per day</th>
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not as a penalty but as liquidated damages representing the parties’ estimate at the time of contract execution of the damages that Owner will sustain for late completion. Owner may also recover the liquidated damages from any money due or that becomes due Contractor. The amount of liquidated damages may be adjusted by Owner in Special Conditions.

The parties stipulate and agree that the actual damages sustained by Owner for late completion of the Project will be uncertain and difficult to ascertain, that calculating Owner’s actual damages would be impractical, unduly burdensome, and cause unnecessary delay, and that the amount of daily liquidated damages set forth above is a reasonable estimate.
Payment of the liquidated damages does not preclude recovery by Owner of other damages or losses under other provisions of the Contract, except for claims related to delays in Substantial Completion or Final Completion. Owner’s right to receive liquidated damages shall not affect Owner’s right to terminate the Contract as provided in these UGSC or elsewhere in the Contract Documents, nor shall termination of the Contract release Contractor from the obligation to pay the liquidated damages.

Article 10. Payments

10.1. Schedule of Values. The Contractor shall submit to the ODR and the A/E for acceptance a Schedule of Values, or Work Breakdown, accurately itemizing material and labor for the various classifications of the Work based on the organization of the specification sections and using the same activity names and terms as the Work Progress Schedule. The accepted Schedule of Values will be the basis for the progress payments under the Contract.

10.1.1 No progress payments will be made prior to receipt and acceptance of the Schedule of Values, provided in such detail as required by the ODR, and submitted not less than twenty-one calendar (21) days prior to the first request for payment. The Schedule of Values shall follow the order of trade divisions of the Specifications and include costs for general conditions, fees, contingencies, and Owner cash allowances, if applicable, so that the sum of the items will equal the Contract Sum. As appropriate, the Contractor shall assign labor and/or material values to each item, the subtotal thereof equaling the value of the Work in place when complete.

10.1.2 The Contractor shall retain a copy of all worksheets used in preparation of its bid or proposal, supported by a notarized statement that the worksheets are true and complete copies of the documents used to prepare the bid or proposal, and make the worksheets available to the ODR at the time of Contract execution. Thereafter the Contractor shall grant the Owner during normal business hours access to said notarized copy of worksheets at any time during the period commencing upon execution of the Contract and ending one year after final payment.

10.2. Progress Payments. The Contractor will receive periodic progress payments for Work performed, materials in place, suitably stored on site, or as otherwise agreed to by the Owner and the Contractor. Payment is not due until receipt by the ODR or his designee of a correct and complete Pay Application in electronic and/or hard copy format as set forth in Special
Conditions or Division 1 Specifications, and certified by the A/E. Progress payments are made provisionally and do not constitute acceptance of Work not in accordance with the Contract Documents. The Owner will not process progress payment applications for Change Order work until all parties execute the Change Order.

10.2.1 Preliminary Pay Worksheet. Once each month that a progress payment is to be requested, the Contractor shall submit to the A/E and the ODR a complete, clean copy of a preliminary pay worksheet or Preliminary Pay Application, to include the following:

10.2.1.1 The Contractor’s estimate of the amount of Work performed, labor furnished and materials incorporated into the Work, using the established Schedule of Values.

10.2.1.2 An updated Work Progress Schedule including the Executive Summary and all required schedule reports.

10.2.1.3 HUB Subcontracting Plan reports.

10.2.1.4 Such additional documentation as Owner may require as set forth elsewhere in the Contract Documents.

10.2.2 Contractor’s Application for Progress Payment. As soon as practicable, but in no event later than seven days after receipt of the Preliminary Pay Worksheet, the A/E and ODR will meet with the Contractor to review the Preliminary Pay Worksheet and to observe the condition of the Work. Based on this review, the ODR and the A/E may require modifications to the Preliminary Pay Worksheet prior to the submittal of an application for progress payment, and will promptly notify the Contractor of revisions necessary for approval. As soon as practicable, the Contractor shall submit its Invoice on the appropriate and completed form, reflecting the required modifications to the Schedule of Values required by the A/E and/or ODR. The Contractor shall attach all additional documentation required by the ODR and/or A/E, as well as an affidavit affirming that all payrolls, bills for labor, materials, equipment, subcontracted work and other indebtedness connected with the Contractor’s invoice are paid or will be paid within the time specified in Tex. Gov’t Code, Chapter 2251. No invoice is complete unless it fully reflects all required modifications, and attaches all required documentation including the Contractor’s affidavit.

10.2.3 Certification by A/E. Within five days or earlier following the A/E’s receipt of the Contractor’s formal invoice, the A/E will review the application for progress payment for completeness, and forward to
the ODR. The A/E will certify that the application is complete and payable, or that it is incomplete, stating in particular what is missing. If the Invoice is incomplete, the Contractor shall make the required corrections and resubmit the Invoice for processing.

10.3 Owner’s Duty to Pay. The Owner has no duty to pay the Contractor except on receipt by the ODR of: 1) a complete Invoice certified by the A/E, and 2) the Contractor’s updated Work Progress Schedule, and 3) confirmation that the Contractor’s as-built documentation at the Site is kept current.

10.3.1 Payment for stored materials and/or equipment confirmed by the Owner and A/E to be on-site or otherwise properly stored is limited to 85 percent of the invoice price or 85 percent of the scheduled value for the materials or equipment, whichever is less.

10.3.2 Retainage. The Owner will withhold from each progress payment, as retainage, 5 percent of the total earned amount, or the amount authorized by law. Retainage is managed in conformance with Tex. Gov’t Code, Chapter 2252, Government Code, subchapter B.

10.3.2.1 The Contractor shall provide written consent of its Surety for any request for reduction or release of retainage.

10.3.2.2 At least sixty-five (65) percent of the total Contract must be completed before the Owner can consider a retainage reduction or release.

10.3.3 Price Reduction to Cover Loss. The Owner may reduce any Periodic Invoice, or application for Progress Payment, prior to payment to the extent necessary to protect the Owner from loss on account of actions of the Contractor including, but not limited to:

10.3.3.1 Defective or incomplete Work not remedied.

10.3.3.2 Damage to Work of a separate Contractor.

10.3.3.3 Failure to maintain scheduled progress or reasonable evidence that the Work will not be completed within the Contract Time.

10.3.3.4 Persistent failure to carry out the Work in accordance with the Contract Documents.

10.3.3.5 Reasonable evidence that the Work cannot be completed for the unpaid portion of the Contract Sum.
10.3.3.6 Assessment of fines for violations of Prevailing Wage Rate law; or

10.3.3.7 Failure to include the appropriate amount of retainage for that periodic progress payment.

10.3.4 Title to all material and Work covered by progress payments transfers to the Owner upon payment.

10.3.4.1 Transfer of title to Owner does not relieve the Contractor of the sole responsibility for the care and protection of materials and Work upon which payments have been made until final acceptance of the entire Work, or the restoration of any damaged Work, or waive the right of the Owner to require the fulfillment of all the terms of the Contract.

10.4 Progress payments to the Contractor do not release the Contractor or its surety from any obligations under the Contract.

10.4.1 Upon the Owner’s request, the Contractor shall furnish manifest proof of the status of Subcontractor’s accounts in a form acceptable to the Owner.

10.4.2 Pay estimate certificates must be signed by a corporate officer or a representative duly authorized by the Contractor.

10.4.3 The Contractor shall provide copies of bills of lading, invoices, delivery receipts or other evidence of the location and value of such materials in requesting payment for materials.

10.4.4 For purposes of Tex. Gov’t Code § 2251.021(a)(2), the date the performance of service is complete is the date when the Owner’s representative approves the application for payment.

10.5 Off-Site Storage. With prior approval by the Owner and in the event Contractor elects to store materials at an off-site location, abide by the following conditions, unless otherwise agreed to in writing by the Owner.

10.5.1 Store materials in a Bonded Commercial Warehouse.

10.5.2 Provide separate Insurance Coverage adequate not only to cover materials while in storage, but also in transit from the off-site storage areas to the Project Site. Copies of duly authenticated certificates of insurance, made out to insure the Owner must be filed with the Owner’s representative.
10.5.3 Inspection by Owner’s representative is allowed at any time. The Owner’s Inspectors must be satisfied with the security, control, maintenance, and preservation measures.

10.5.4 Materials for this Project are physically separated and marked for the Project in a sectioned-off area. Only materials which have been approved through the submittal process are to be considered for payment.

10.5.5 Owner reserves the right to reject materials at any time prior to final acceptance of the complete Project if they do not meet Contract requirements regardless of any previous progress payment made.

10.5.6 With each monthly payment estimate, submit a report to the ODR, A/E, and Inspector listing the quantities of materials already paid for and still stored in the off-site location.

10.5.7 Make warehouse records, receipts and invoices available to Owner’s representatives, upon request, to verify the quantities and their disposition.

10.5.8 In the event of Contract termination or default by Contractor, the items in storage off-site, upon which payment has been made, will be promptly turned over to Owner or Owner’s agents at a location near the jobsite as directed by the ODR. The full provisions of performance and payment bonds on this Project cover the materials off-site in every respect as though they were stored on the Project Site.

**Article 11. Changes**

11.1. Change Orders. A Change Order issued after execution of the Contract is a written order to the Contractor, signed by the ODR, the Contractor, and the A/E, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time can only be changed by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum and/or the Contract Time. The ODR may issue written authorization for the Contractor to proceed with work of a Change Order in advance of final execution by all parties. In the absence of an agreement with the Contractor on a Change Order, the Owner may issue a Unilateral Change Order that will have the full force and effect of a contract modification. The issuance of a Unilateral Change Order does not prejudice the Contractor’s rights to make claims or to appeal disputed matters under terms of the Contract.
11.1.1 The Owner, without invalidating the Contract, and without prior approval of the surety, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, and the Contract Sum and the Contract Time will be adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents. If such changes cause an increase or decrease in the Contractor’s cost of, or time required for, performance of the Contract, an equitable adjustment shall be made and confirmed in writing in a Change Order.

11.1.2 It is recognized by the parties hereto and agreed by them that the Drawings and Specifications may not be complete or free from errors, omissions and imperfections or that they may require changes or additions in order for the Work to be completed to the satisfaction of Owner and that, accordingly, it is the express intention of the parties, notwithstanding any other provisions in this Contract, that any errors, omissions or imperfections in such Drawings and Specifications, or any changes in or additions to same or to the Work ordered by Owner and any resulting delays in the Work or increases in Contractor’s costs and expenses, shall not constitute or give rise to any claim, demand or cause of action of any nature whatsoever in favor of Contractor, whether for breach of contract, quantum meruit, or otherwise; provided, however, that Owner shall be liable to Contractor for the sum stated to be due Contractor in any Change Order approved and signed by both parties, it being agreed hereby that such sum, together with any extension of time contained in said Change Order, shall constitute full compensation to Contractor for all costs, expenses and damages to Contractor, whether direct, consequential or otherwise in any wise incident to, arising out of, or resulting directly or indirectly from the work performed by Contractor under such Change Order.

11.1.3 Procedures for administration of Change Orders shall be established by the Owner and stated elsewhere in the Contract Documents.

11.1.4 Except as provided above, no order, oral statement, or direction of the Owner or his duly appointed representative shall be treated as a change under this article or entitle the Contractor to an adjustment.

11.1.5 The Contractor agrees that the Owner or any of its duly authorized representatives shall have access and the right to examine any directly pertinent books, documents, papers, and records of the Contractor. Further, the Contractor agrees to include in all its subcontracts a provision to the effect that the Subcontractor agrees that the Owner or any of its duly authorized representatives shall
have access to and the right to examine any directly pertinent books, documents, papers and records of such Subcontractor relating to any claim arising from this Contract, whether or not the Subcontractor is a party to the claim. The period of access and examination described herein which relates to appeals under the Disputes article of the Contract, litigation, or the settlement of claims arising out of the performance of the Contract shall continue until final disposition of such claims, appeals or litigation.

11.2 Unit Prices. If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a Change Order that application of the agreed unit prices to the quantities of work proposed will cause substantial inequity to the Owner or the Contractor, the applicable unit prices shall be equitably adjusted as provided in the Special Conditions or as agreed to by the parties and incorporated into the Change Order.

11.3 Claims for Additional Costs

11.3.1 If the Contractor wishes to make a claim for an increase in the Contract Sum not related to a requested change, it shall give the Owner and the A/E written notice thereof within twenty-one (21) days after the occurrence of the event giving rise to such claim, but, in any case before proceeding to execute the work considered to give rise to the additional cost or time, except in an emergency endangering life or property in which case the Contractor shall act in accordance with Article 7.2.1. No such claim shall be valid unless so made. If the Owner and the Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined as set forth under Article 15. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.

11.3.2 If the Contractor claims that additional cost is involved because of, but not limited to: 1) any written interpretation of the Contract Documents, 2) any order by the Owner to stop the Work pursuant to Article 14 where the Contractor was not at fault, or 3) any written order for a minor change in the Work issued pursuant to Article 11.4, the Contractor shall make such claim as provided in Article 11.3.1.

11.3.3 Should the Contractor or its Subcontractors fail to call attention of the A/E to obvious discrepancies or omissions in the Bid/Proposal Documents during the pre-bid/pre-proposal period, but claim additional costs for corrective work after contract award, the Owner may assume intent to circumvent competitive bidding for necessary corrective work. In such case, the Owner may choose to let a separate contract for the corrective work, or issue a Unilateral
Change Order to require performance by the Contractor. Claims for time extensions or for extra cost resulting from delayed notice of contract document discrepancies or omissions will not be considered by the Owner.

11.4. Minor Changes. The A/E, with concurrence of the ODR, will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time. Such changes shall be effected by written order which the Contractor shall carry out promptly and record on as-built record documents.

11.5. Concealed Site Conditions. If, in the performance of the Contract, subsurface, latent or concealed conditions at the Site are found to be materially different from the information included in the bid/proposal documents, or if unknown conditions of an unusual nature are discovered differing materially from the conditions usually inherent in work of the character shown and specified, the ODR and the A/E shall be notified in writing of such conditions before they are disturbed. Upon such notice, or upon its own observation of such conditions, the A/E, with the approval of the ODR, will promptly make such changes in the Drawings and Specifications as they deem necessary to conform to the different conditions, and any increase or decrease in the cost of the Work, or in the time within which the Work is to be completed, resulting from such changes will be adjusted by Change Order, subject to the prior approval of the ODR.

11.6. Extension of Time. All Changes to the Contract Time shall be made as a consequence of requests as required under Article 9.6, and as documented by Change Order as provided under Article 11.1.

11.7. Administration of Change Orders. All changes in the Contract shall be administered in accordance with procedures approved by the Owner, and when required make use of such electronic information management system(s) as the Owner may employ.

11.7.1 Routine changes in the Contract shall be formally initiated by the ODR, Contractor or A/E by means of a contract change form detailing requirements of the proposed change for pricing by the Contractor. This action may be preceded by communications between the Contractor, A/E and ODR concerning the need and nature of the change, but such communications shall not constitute a basis for beginning the proposed Work by the Contractor. Except for emergency conditions described below, approval of the Contractor’s cost proposal by the Owner will be required for authorization to proceed with the Work being changed. The Owner will not be responsible for the cost of work changed without prior approval and the Contractor may be required to remove work so installed.
11.7.2 All proposed costs for change order work must be supported by itemized accounting of material, equipment and associated itemized installation costs in sufficient detail, following the outline and organization of the established Schedule of Values, to permit analysis by the A/E and ODR using current estimating guides and/or practices. Photocopies of Subcontractor and vendor proposals shall be furnished unless specifically waived by the ODR. Contractor shall provide written response to a Contract Revision within twenty-one (21) calendar days of receipt.

11.7.3 Any unexpected circumstance which necessitates an immediate change in order to avoid a delay in progress of the Work may be expedited by written communication and authorization between the Contractor and Owner. A limited scope not-to-exceed estimate of cost and time will be requested prior to authorizing Work to proceed. Should the estimate be impractical for any reason, the ODR may authorize the use of detailed cost records of such Work to establish and confirm the actual costs and time for documentation in a formal Change Order.

11.7.4 Emergency changes to save life or property may be initiated by the Contractor alone (see Article 7.3) with the claimed cost and/or time of such work to be fully documented as to necessity and detail of the reported costs and/or time.

11.7.5 The method of incorporating approved change orders into the parameters of the accepted Schedule of Values must be coordinated and administered in a manner acceptable to the ODR.

11.8 Pricing Change Order Work. The amounts that the Contractor and/or its Subcontractors add to a Contract Change for profit and overhead will also be considered by the Owner before approval is given and a Change Order issued. The amounts established hereinafter are the maximums that are acceptable to the Owner.

11.8.1 For work performed by its forces, the Contractor will be allowed its actual costs for materials, equipment charges, the total amount of wages paid for labor, the total cost of Federal Old Age Benefit (Social Security Tax) and for Worker’s Compensation and Comprehensive General Liability Insurance, plus Bond cost if the change results in an increase in the Bond premium paid by the Contractor. To the total of the above costs, the Contractor will be allowed to add a percentage as noted below to cover overhead and profit combined. Overhead shall be considered to include insurance other than mentioned above, field and office supervisors and
assistants, including safety and scheduling personnel, use of small tools, incidental job burdens and general home office expenses, and no separate allowance will be made therefore. Allowable percentages for overhead and profit on changes will not exceed 15 percent if the total of self-performed work is less than or equal to $10,000, 10 percent if the total of self-performed work is between $10,000 and $20,000 and 7.5 percent if the total of self-performed work is over $20,000, for any specific change priced.

11.8.2 For subcontracted Work each affected Subcontractor shall figure its costs, overhead and profit as described above for Contractor's work, all subcontractor costs shall be combined, and to that total subcontractor cost the Contractor will be allowed to add a maximum mark-up of 10 percent if the total of all subcontracted work is less than or equal to $10,000, 7.5 percent if the total of all subcontracted work is between $10,000 and $20,000 and 5 percent if the total of all subcontractor work is over $20,000.

11.8.3 On changes involving both additions and deletions, percentages for overhead and profit will be allowed only on the net addition. The Owner does not accept and will not pay for additional contract cost identified as indirect, consequential, or as damages caused by delay.

11.8.4 On contracts based on a Guaranteed Maximum Price (GMP), the Construction Manager-at-Risk or Design Build Firm shall NOT be entitled to a percentage mark-up on any change order work unless the Change Order increases the Guaranteed Maximum Price.

Article 12. Project Completion and Acceptance

12.1. Closing Inspections

12.1.1 Substantial Completion Inspection. When the Contractor considers the entire Work or part thereof Substantially Complete, it shall notify the ODR in writing that the Work will be ready for Substantial Completion Inspection on a specific date. The Contractor shall include with this notice the Contractor's Punchlist to indicate that it has previously inspected all the Work associated with the request for inspection, has corrected items where possible, and includes all items scheduled for completion or correction prior to final inspection. The failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. If any of the items on this list prevents the facility from being used as intended, the Contractor shall not request a Substantial Completion Inspection. The Owner and its
representatives will review the list of items and schedule the requested inspection, or inform the Contractor in writing that such an inspection is premature because the Work is not sufficiently advanced or conditions are not as represented on the Contractor's list.

12.1.1.1 Prior to the Substantial Completion Inspection, the Contractor shall furnish a copy of its marked-up As-Built Drawings and a preliminary copy of each instructional manual, maintenance and operating manual, parts catalog, wiring diagrams, spare parts, specified written warranties and like publications or parts for all installed equipment, systems and like items. Delivery of these items is a prerequisite for requesting the Substantial Completion Inspection.

12.1.1.2 On the date requested by Contractor, or as mutually agreed upon pending the status of the open items list, the A/E, ODR, the Contractor and other Owner representatives as determined by the Owner, will jointly attend the Substantial Completion Inspection, which shall be conducted by the ODR or their delegate. If the ODR determines that the Work is Substantially Complete, the ODR will issue a Certificate of Substantial Completion to be signed by the A/E, Owner and Contractor, establishing the date of Substantial Completion, and identifying responsibilities for security, maintenance, and insurance. A/E will provide with this certificate a list of punchlist items (the Pre-Final Punchlist) for completion prior to final inspection. This list may include items in addition to those on the Contractor's punchlist, which the inspection team deems necessary to correct or complete prior to Final Inspection. If the Owner occupies the facility upon determination of Substantial Completion, the Contractor shall complete all corrective Work at the convenience of the Owner, without disruption to Owner's use of the facility for its intended purposes.

12.1.2 Final Inspection. The Contractor shall complete the list of items identified on the Pre-Final Punchlist prior to requesting a Final Inspection. Unless otherwise specified, or otherwise agreed in writing by the parties as documented on the Certificate of Substantial Completion, the Contractor shall complete and/or correct all Work within thirty (30) days of the Substantial Completion date. Upon completion of the Pre-Final Punchlist work, the Contractor shall give written notice to the ODR and A/E that the Work will be ready for
Final Inspection on a specific date. The Contractor shall accompany this notice with a copy of the updated Pre-Final Punchlist indicating resolution of all items. On the date specified or as soon thereafter as is practicable, the ODR, A/E and the Contractor will inspect the Work. The A/E will submit to the Contractor a Final Punchlist of open items that the inspection team requires corrected or completed before final acceptance of the Work.

12.1.2.1 The Contractor must correct or complete all items on the Final Punchlist before requesting Final Payment. Unless otherwise agreed to in writing by the parties, complete this work within seven (7) days of receiving the Final Punchlist. Upon completion of the Final Punchlist, the Contractor shall notify the A/E and ODR in writing stating the disposition of each Final Punchlist item. The A/E, Owner and Contractor shall promptly inspect the completed items. When the Final Punchlist is complete, and the Contract is fully satisfied according to the Contract Documents the ODR will issue a certificate establishing the date of Final Completion. Completion of all Work is a condition precedent to the Contractor’s right to receive Final Payment.

12.1.3 **Annotation.** Any certificate issued under this Article may be annotated to indicate that it is not applicable to specified portions of the Work, or that it is subject to any limitation as determined by the Owner.

12.1.4 **Purpose of Inspection.** Inspection is for determining the completion of the Work, and does not relieve the Contractor of its overall responsibility for completing the Work in a good and competent fashion, in compliance with the Contract. Work accepted with incomplete punchlist items or failure of the Owner or other parties to identify Work that does not comply with the Contract Documents or is defective in operation or workmanship does not constitute a waiver of the Owner’s rights under the Contract or relieve the Contractor of its responsibility for performance or warranties.

12.1.5 **Additional Inspections**

12.1.5.1 If the Owner’s inspection team determines that the Work is not Substantially Complete at the Substantial Completion Inspection, the ODR or A/E will give the Contractor written notice listing cause(s) of the rejection. The ODR will set a time for completion of incomplete or defective work. The Contractor must complete or correct all work so designated.
prior to requesting a second Substantial Completion Inspection.

12.1.5.2 If the Owner's inspection team determines that the Work is not complete at the Final Inspection, the ODR or the A/E will give the Contractor written notice listing the cause(s) of the rejection. The ODR will set a time for completion of incomplete or defective work. The Contractor shall complete or correct all Work so designated prior to again requesting a Final Inspection.

12.1.5.3 The Contract contemplates three (3) comprehensive inspections: the Substantial Completion Inspection, the Final Completion Inspection, and the Inspection of Completed Final Punchlist Items. The cost to the Owner of additional inspections resulting from the Work not being ready for one or more of these inspections is the responsibility of the Contractor. The Owner may issue a Unilateral Change Order deducting these costs from Final Payment. Upon the Contractor's written request, the Owner will furnish documentation of any costs so deducted. Work added to the Contract by Change Order after Substantial Completion Inspection is not corrective work for purposes of determining timely completion, or assessing the cost of additional inspections.

12.1.6 Phased Completion. The Contract may provide, or project conditions may warrant, as determined by the ODR, that designated elements or parts of the Work be completed in phases. Where phased completion is required or specifically agreed to by the parties, the provisions of the Contract related to Closing Inspections, Occupancy and Acceptance apply independently to each designated element or part of the Work. For all other purposes, unless otherwise agreed by the parties in writing, Substantial Completion of the Work as a whole is the date on which the last element or part of the Work completed receives a Substantial Completion certificate. Final Completion of the Work as a whole is the date on which the last element or part of the Work completed receives a Final Completion certificate.

12.2 Owner's Right of Occupancy. The Owner may occupy or use all or any portion of the Work following Substantial Completion, or at any earlier stage of completion. Should the Owner wish to use or occupy the Work, or part thereof, prior to Substantial Completion, the ODR will notify the Contractor in writing. Work performed on the premises by third parties on the Owner's behalf does not constitute occupation or use of the Work by the Owner for purposes of this Article. All Work performed by the Contractor after
occupancy, whether in part or in whole, shall be at the convenience of the Owner so as to not disrupt Owner’s use of, or access to, occupied areas of the Project.

12.3 Acceptance & Payment

12.3.1 Request for Final Payment. Following the certified completion of all Work, including all punch list items, cleanup, and the delivery of record documents, the Contractor shall submit a certified Application for Final Payment. The Contractor must include in the Application of Final Payment all sums held as retainage and forward to the A/E and the ODR for review and approval.

12.3.2 Final Payment Documentation. The Contractor shall submit, prior to or with the Application for Final Payment, final copies of all Close-Out Documents, maintenance and operating instructions, guarantees and warranties, certificates, record documents and all other items required by the Contract. The Contractor shall submit Consent of Surety to Final Payment and an affidavit that all payrolls, bills for materials and equipment, subcontracted work and other indebtedness connected with the Work, except as specifically noted, are paid, will be paid, or otherwise satisfied within the period of time required by Tex. Gov’t Code, Chapter 2251. The Contractor shall furnish documentation establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of claims and liens arising out of the Contract. The Contractor may not subsequently submit a claim on behalf of a Subcontractor or vendor unless the Contractor’s affidavit notes that claim as an exception.

12.3.3 A/E Approval. The A/E will review a submitted Application for Final Payment promptly but in no event later than ten (10) days after its receipt. Prior to the expiration of this deadline, the A/E will either 1) return the Application for Final Payment to Contractor with corrections for action and resubmission or 2) accept it, note its approval and send to Owner.

12.3.4 Offsets and Deductions. The Owner may deduct from the Final Payment all sums due from the Contractor. If the Certificate of Final Completion notes any Work remaining, incomplete, or any defects not remedied, the Owner may deduct the cost of remedying such deficiencies from the Final Payment. On such deductions, the Owner will identify each deduction, the amount, and the explanation of the deduction on or by the 21st day after Owner's receipt of an approved Application for Final Payment. Such offsets and deductions shall be incorporated via a final Change Order, including a Unilateral Change Order as may be applicable.
12.3.5 **Final Payment Due.** Final Payment is due and payable by the Owner, subject to all allowable offsets and deductions, on the 31\textsuperscript{st} day following the Owner’s approval of the final Application for Payment. If the Contractor disputes any amount deducted by the Owner, the Contractor shall give notice of the dispute on or before the thirtieth (30\textsuperscript{th}) day following receipt of Final Payment. Failure to do so will bar any subsequent claim for payment of amounts deducted.

12.3.6 **Effect of Final Payment.** Final Payment constitutes a waiver of all claims by the Owner, relating to the condition of the Work except those arising from:

12.3.6.1 Faulty or defective Work appearing after Substantial Completion (latent defects); and/or

12.3.6.2 Failure of the Work to comply with the requirements of the Contract Documents; and/or

12.3.6.3 Terms of any warranties required by the Contract, or implied by law; and/or

12.3.6.4 Claims arising from personal injury or property damage to third parties.

12.3.7 **Waiver of Claims.** Final payment constitutes a waiver of all claims and liens by the Contractor except those specifically identified in writing and submitted to the ODR prior to the application for Final Payment.

12.3.8 **Effect on Warranty.** Regardless of approval and issuance of Final Payment, the Contract is not deemed fully performed by the Contractor and closed until the expiration of all warranty periods.

**Article 13. Warranty and Guarantee**

13.1. **Contractor's General Warranty and Guarantee.** Contractor warrants to the Owner that all Work is executed in accordance with the Contract, complete in all parts and in accordance with approved practices and customs, and of the best finish and workmanship. The Contractor further warrants that unless otherwise specified, all materials and equipment incorporated in the Work under the Contract are new. The Owner may, at its option, agree in writing to waive any failure of the Work to conform to the Contract, and to accept a reduction in the Contract Sum for the cost of repair or diminution in value of the Work by reason of such defect. Absent such a written agreement, the Contractor's obligation to perform and complete the Work in
accordance with the Contract Documents is absolute and is not waived by any inspection or observation by the Owner, A/E or others, by making any progress payment or final payment, by the use or occupancy of the Work or any portion thereof by the Owner, at any time, or by any repair or correction of such defect made by the Owner.

13.2. Warranty Period. Except as may be otherwise specified or agreed, the Contractor shall repair all defects in materials, equipment, or workmanship appearing within one year from the date of Substantial Completion of the Work. If Substantial Completion occurs by phase, then the warranty period for that particular Work begins on the date of such occurrence, or as otherwise stipulated on the Certificate of Substantial Completion for the particular Work.

13.3 Limits on Warranty. Contractor’s warranty and guarantee hereunder excludes defects or damage caused by:

13.3.1 Modification or improper maintenance or operation by persons other than Contractor, Subcontractors, or any other individual or entity for whom Contractor is responsible, unless Owner is compelled to undertake maintenance or operation due to the neglect of the Contractor.

13.3.2 Normal wear and tear under normal usage after acceptance of the Work by the Owner.

13.4 Events Not Affecting Warranty. Contractor’s obligation to perform and complete the Work in a good and workmanlike manner in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor’s obligation to perform the Work in accordance with the Contract Documents:

13.4.1 Observations by Owner and/or A/E;

13.4.2 Recommendation to pay any progress or final payment by A/E;

13.4.3 The issuance of a Certificate of Substantial Completion or any payment by Owner to Contractor under the Contract Documents;

13.4.4 Use or occupancy of the Work or any part thereof by Owner;

13.4.5 Any acceptance by Owner or any failure to do so;

13.4.6 Any review of a Shop Drawing or Sample submittal; or
13.4.7 Any inspection, test or approval by others.

13.5 Separate Warranties. If a particular piece of equipment or component of the Work for which the Contract requires a separate warranty is placed in continuous service before Substantial Completion, the Warranty Period for that equipment or component will not begin until Substantial Completion, regardless of any warranty agreements in place between suppliers and/or Subcontractors and the Contractor. The ODR will certify the date of service commencement in the Certificate of Substantial Completion.

13.5.1 In addition to the Contractor's warranty and duty to repair, the Contractor expressly assumes all warranty obligations required under the Contract for specific building components, systems and equipment.

13.5.2 The Contractor may satisfy any such obligation by obtaining and assigning to the Owner a complying warranty from a manufacturer, supplier, or Subcontractor. Where an assigned warranty is tendered and accepted by the Owner which does not fully comply with the requirements of the Contract, the Contractor remains liable to the Owner on all elements of the required warranty not provided by the assigned warranty.

13.6 Correction of Defects. Upon receipt of written notice from the Owner, or any agent of the Owner designated as responsible for management of the Warranty Period, of the discovery of a defect, the Contractor shall promptly remedy the defect(s), and provide written notice to the Owner and designated agent indicating action taken. In case of emergency where delay would cause serious risk of loss or damage to the Owner, or if the Contractor fails to remedy within 30 days, or within another period agreed to in writing, the Owner may correct the defect and be reimbursed the cost of remedying the defect from the Contractor or its Surety.

13.7 Certification of No Asbestos Containing Materials or Work. The Contractor shall ensure compliance with the Asbestos Hazard Emergency Response Act (AHERA–40 CFR 763-99 (7)) from all Subcontractors and materials suppliers, and shall provide a notarized certification to the Owner that all equipment and materials used in fulfillment of its contract responsibilities are non-Asbestos Containing Building Materials (ACBM). This certification must be provided no later than the Contractor’s application for Final Payment.

Article 14. Suspension and Termination

14.1 Suspension of Work for Cause. The Owner may, at any time without prior notice, suspend all or any part of the Work, if after reasonable observation and/or investigation, the Owner determines it is necessary to do so to
prevent or correct any condition of the Work, which constitutes an immediate safety hazard, or which may reasonably be expected to impair the integrity, usefulness or longevity of the Work when completed.

14.1.1 The Owner will give the Contractor a written notice of suspension for cause, setting forth the reason for the suspension and identifying the Work suspended. Upon receipt of such notice, the Contractor shall immediately stop the Work so identified. As soon as practicable following the issuance of such a notice, the Owner will initiate and complete a further investigation of the circumstances giving rise to the suspension, and issue a written determination of the findings.

14.1.2 If it is confirmed that the cause was within the control of the Contractor, the Contractor will not be entitled to an extension of time or any compensation for delay resulting from the suspension. If the cause is determined not to have been within the control of the Contractor, and the suspension has prevented the Contractor from completing the Work within the Contract Time, the suspension is an Excusable Delay and a Time Extension will be granted through a Change Order.

14.1.3 Suspension of work under this provision will be no longer than is reasonably necessary to remedy the conditions giving rise to the suspension.

14.2 Suspension of Work for Owner's Convenience. Upon seven (7) calendar days written notice to the Contractor, the Owner may at any time without breach of the Contract suspend all or any portion of the Work for a period of up to thirty days for its own convenience. The Owner will give the Contractor a written notice of suspension for convenience, which sets forth the number of suspension days for which the Work, or any portion of it, will be suspended and the date on which the suspension of Work will cease. When a suspension prevents the Contractor from completing the Work within the Contract Time, it is an Excusable Delay. A notice of suspension for convenience may be modified by the Owner at any time on seven (7) calendar days written notice to the Contractor. If the Owner suspends the Work for its convenience for more than sixty (60) consecutive calendar days, the Contractor may elect to terminate the Contract pursuant to the provisions of the Contract.

14.3 Termination by Owner for Cause.

14.3.1 The Owner may, without prejudice to any right or remedy, terminate the employment of the Contractor and take possession of the Site and of all materials, equipment, tools, construction equipment and
machinery thereon owned by the Contractor, under any of the following circumstances:

14.3.1.1 Persistent or repeated failure or refusal, except during complete or partial suspensions of work authorized under the Contract, to supply enough properly skilled workmen or proper materials; and/or

14.3.1.2 Persistent disregard of laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, including the ODR; and/or

14.3.1.3 Persistent failure to prosecute the Work in accordance with the Contract, and to insure its completion within the time, or any approved extension thereof, specified in this Contract; and/or

14.3.1.4 Failure to remedy defective work condemned by the ODR; and/or

14.3.1.5 Failure to pay Subcontractors, laborers, and material suppliers pursuant to Tex. Gov’t Code Chapter 2251; and/or

14.3.1.6 Persistent endangerment to the safety of laborers or of the Work; and/or

14.3.1.7 Failure to supply or maintain statutory bonds or to maintain required insurance, pursuant to the Contract; and/or

14.3.1.8 Any material breach of the Contract; and/or

14.3.1.9 The Contractor’s insolvency, bankruptcy, or demonstrated financial inability to perform the Work.

14.3.2 Failure by the Owner to exercise the right to terminate in any instance is not a waiver of the right to do so in any other instance.

14.3.3 Should the Owner decide to terminate the employment of the Contractor under the provisions of Article 14.3.1, it will provide to the Contractor and its Surety thirty (30) days prior written notice.

14.3.4 Should the Contractor or its Surety, after having received notice of termination, remedy to the satisfaction of the Owner the condition(s) upon which the notice of termination was based, the notice of
14.3.5 If the Contractor or its Surety fails to remedy the condition(s) to the satisfaction of the Owner within thirty (30) days following receipt of notice, the Owner may **immediately terminate the Contract, make arrangements** for completion of the Work, and deduct the cost of completion from the unpaid Contract Sum.

14.3.5.1 Cost of completion includes additional Owner costs such as A/E services, the cost of other consultants, and contract administration.

14.3.5.2 The Owner will make no further payment to the Contractor or its Surety until all costs of completing the Work are paid. If the unpaid balance of the Contract Sum exceeds the costs of administering and finishing the Work, the Contractor will receive the excess funds. If such costs exceed the unpaid balance, the Contractor or its Surety will pay the difference to the Owner.

14.3.5.3 This obligation for payment survives the termination of the Contract.

14.3.5.4 The Owner reserves the right in termination for cause to take assignment of all contracts between the Contractor and its Subcontractors, vendors and suppliers. The ODR will promptly notify the Contractor of the contracts the Owner elects to assume. Upon receipt of such notice, the Contractor shall promptly take all steps necessary to effect such assignment.

14.4 Termination for Convenience of Owner. The Owner reserves the right, without breach, to terminate the Contract prior to, or during the performance of the Work, for any reason. Upon such an occurrence, the following shall apply:

14.4.1 The Owner will immediately notify the Contractor and the A/E in writing, specifying the reason for and the effective date of contract termination. Such notice may also contain instructions necessary for the protection, storage or decommissioning of incomplete work or systems, and for safety.

14.4.2 Upon receipt of the notice of termination, the Contractor shall immediately proceed with the following obligations, regardless of any
delay in determining or adjusting any amounts due at that point in the Contract:

14.4.2.1 Stop all work.

14.4.2.2 Place no further subcontracts or orders for materials or service.

14.4.2.3 Terminate all subcontracts.

14.4.2.4 Cancel all materials and equipment orders as applicable.

14.4.2.5 Take action that is necessary to protect and preserve all property related to this Contract which is in the possession of the Contractor.

14.4.3 When the Contract is terminated for the Owner's convenience, the Contractor may recover from the Owner payment for all Work executed before the notice of termination along with the actual and reasonable cost of any additional work required to secure the Project and property related to the Contract following the notice of termination. The Contractor will not be entitled to recover any other costs or damages arising from the termination for convenience of the Owner including, but not limited to, claims for lost business opportunities.

14.5 Termination By Contractor. If the Work is stopped for a period of ninety (90) days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the Contractor, then the Contractor may, upon thirty (30) additional days' written notice to the ODR, terminate the Contract and recover from the Owner payment for all Work executed before the work stoppage along with the actual and reasonable cost of securing the Project and property related to the Contract during the period of work stoppage. The Contractor will not be entitled to recover any other costs or damages arising from the work stoppage including, but not limited to, claims for lost business opportunities. If the cause of the work stoppage is removed prior to the end of the thirty (30) day notice period, the Contractor may not terminate the Contract but may be entitled to an equitable adjustment in the Contract Sum and Contract Time.

14.6 Settlement on Termination. When the Contract is terminated for any reason, at any time prior to 180 days after the effective date of termination,
the Contractor shall submit a final termination settlement proposal to the Owner based upon recoverable costs as provided under the Contract. If the Contractor fails to submit the proposal within the time allowed, the Owner may determine the amount due to the Contractor because of the termination and pay the determined amount to the Contractor.

**Article 15. Dispute Resolution**

15.1 *Unresolved Contractor Disputes.* The dispute resolution process provided for in Tex. Gov’t Code, Chapter 2260, shall be used by the Owner and the Contractor to attempt to resolve any claim for breach of contract made by the Contractor, that is not resolved under procedures described throughout these Uniform General and Supplementary Conditions, or Special Conditions of the Contract.

15.2 *Alternative Dispute Resolution Process.* The Owner may establish a dispute resolution process to be utilized in advance of that outlined in Tex. Gov’t Code, Chapter 2260.

15.3 *Nothing in the Contract shall prevent or be construed as a waiver of Owner’s right to seek redress on any disputed matter in a court of competent jurisdiction.*

15.4 *Nothing in the Contract shall waive or be construed to waive the state’s sovereign immunity.*

**Article 16. Miscellaneous**

16.1 *Special Conditions.* When the Work contemplated by the Owner is of such a character that the foregoing Uniform General and Supplementary Conditions of the Contract cannot adequately cover necessary and additional contractual relationships, the Contract may include Special Conditions. Special Conditions shall relate to a particular project and be peculiar to that project but shall not weaken the character or intent of the Uniform General and Supplementary Conditions.

16.2 *Federally Funded Projects.* On Federally funded projects, the Owner may waive, suspend or modify any Article in these Uniform General and Supplementary Conditions which conflicts with any Federal statute, rule, regulation or procedure, where such waiver, suspension or modification is essential to receipt by the Owner of such Federal funds for the Project. In the case of any project wholly financed by Federal funds, any standards required by the enabling Federal statute, or any Federal rules, regulations or procedures adopted pursuant thereto, shall be controlling.
16.3 **Internet-based Project Management Systems.** At its option, the Owner may administer its design and construction management through an Internet-based management system. In such cases, the Contractor shall conduct communication through this media and perform all project related functions utilizing this database system. This includes correspondence, submittals, requests for information, vouchers or payment requests and processing, amendment, change orders and other administrative activities.

16.3.1 **Accessibility and Administration.**

16.3.1.1 When used, the Owner will make the software accessible via the Internet to all project team members.

16.3.1.2 The Owner shall administer the software.

16.3.2 **Training.** When used, the Owner shall provide training to the project team members.

16.4 **Conflict of Interest.** By executing this Agreement, PROVIDER and each person signing on behalf of PROVIDER certifies, and in the case of a sole proprietorship, partnership or corporation, each party thereto certifies as to its own organization, that to the best of their knowledge and belief, no member of The A&M System or The A&M System Board of Regents, nor any employee, or person, whose salary is payable in whole or in part by The A&M System, has direct or indirect financial interest in the award of this Agreement, or in the services to which this Agreement relates, or in any of the profits, real or potential, thereof.

16.5 **Prohibition on Contracts with Companies Boycotting Israel.** By executing this Agreement, the PROVIDER certifies it does not and will not, during the performance of this contract, boycott Israel. PROVIDER acknowledges this Agreement may be terminated if this certification is inaccurate.

16.6 **Certification Regarding Business with Certain Countries and Organizations.** Pursuant to Subchapter F, Chapter 2252, Texas Government Code, PROVIDER certifies it is not engaged in business with Iran, Sudan, or a foreign terrorist organization. PROVIDER acknowledges this Agreement may be terminated if this certification is inaccurate.

**END OF UNIFORM GENERAL AND SUPPLEMENTARY CONDITIONS**
DIVISION 1
GENERAL REQUIREMENTS
01 11 00 SUMMARY OF WORK

1.00 GENERAL

1.01 WORK INCLUDED

A. Construct Work as described in the Contract Documents.
   1. Provide the materials, equipment, and incidentals required to make the Project completely and fully operable.
   2. Provide the labor, equipment, tools, and consumable supplies required for a complete Project.
   3. Provide the architectural, structural, mechanical, electrical, instrumentation and all other Work required for a complete and operable Project.
   4. Test and place the completed Project in operation.
   5. Provide the special tools, spare parts, lubricants, supplies, or other materials as indicated in Contract Documents for the operation and maintenance of the Project.
   6. Install Owner provided products and place in operation.
   7. The Contract Documents do not indicate or describe all of the Work required to complete the Project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Engineer.

1.02 JOB CONDITIONS

A. The General Conditions, the Supplementary Conditions, and General Requirements apply to each Section of the Specifications.
B. Comply with all applicable state and local codes and regulations pertaining to the nature and character of the Work being performed.

1.03 DESCRIPTION OF WORK

A. Work is described in general, non-inclusive terms as:
   1. Selective Demolition and Reconstruction of the north wall and adjacent interior rooms at the University Center Building, including mechanical, electrical, fire alarm and suppression systems.
   2. Selective Removal and Replacement of roofing systems at the University Center Building.
   3. Selective removal and replacement of window systems on the north wall at the University Center Building. Removal of glass block wall and infill of same on south wall.

1.04 CONSTRUCTION OF UTILITIES

1. Contractor may provide temporary power connections if required for the project site through the power utility.
2. Cost for providing temporary power will be paid for by the Contractor.
3. Pay for temporary power, including, but not limited to construction cost, equipment, connection fees and permits.

1.05 OCCUPANCY

A. As soon as any portion of the structure and equipment are ready for use, the Owner shall have the right to occupy or operate that portion upon written notice to the Contractor.

B. The facility shall be occupied during the course of this project.

C. Testing of equipment and appurtenances including specified test periods, training, and startup does not constitute acceptance for operation.

D. Owner may accept the new work for continued use after startup and testing at the option of the Owner.

E. The execution of bonds is understood to indicate the consent of the surety to the technical provisions and design drawings provided for this project.

F. Provide an endorsement from the insurance carrier permitting occupancy of the structures and use of equipment during the remaining period of construction.

G. Conduct operations to insure the least inconvenience to the Owner and general public.

2.00 PRODUCTS

2.01 MATERIALS

A. Provide materials and products per the individual Sections of the Specifications.

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION
1.00 GENERAL

1.01 REQUIREMENTS

A. Bid Options:
   1. This Section describes each bid option by number and describes the basic changes to be incorporated into the Work when this bid option is made a part of the Work in the Agreement.
   2. Drawings and Specifications will outline the extent of Work to be included in the bid option Contract Price.
   3. Coordinate related Work and modify surrounding Work as required to properly integrate the Work under each bid option, and provide a complete and functional system as required by the Contract Documents.
   4. Bid options will be accepted or rejected at the option of the Owner in any sequence.
   5. Bid option prices will be maintained a minimum of 120 days, unless noted otherwise.

B. Allowances:
   1. Include specified allowance amount in Contract Price.
   2. The amount of each allowance includes:
      a. The cost of the product to the Contractor less any applicable trade discounts.
      b. Delivery to the Site.
      c. Applicable taxes.
   3. Include in the Contract Price all costs for:
      a. Handling at the Site, including unloading, uncrating, and storage per Section 01 31 00 “Project Management.”
      b. Cost for labor and equipment for installation and finishing.
      c. Cost for related products not specifically listed in the allowance required for installation, including consumable supplies and materials.
      d. All overhead, profit, and related costs.
   4. Assist Owner in the selection of products.
      a. Determine qualified Suppliers.
      b. Obtain proposals from qualified Suppliers.
      c. Present available alternates to the Owner through the Engineer. Notify Engineer of:
         1). Any objections to a particular Supplier or product.
         2). Effect on the Construction Schedule anticipated by the selection of each option.
         3). Cost of each option.
5. Upon selection of the product:
   a. Purchase and install the product.
   b. Contractor’s responsibilities for products shall be the same as for products selected
      by the Contractor.

6. Submit a Contract Modification Request per Section 01 31 13 “Project Coordination” to
   adjust Contract Price if the net cost of the product is more or less than the specified
   amount.
   a. For products specified as Unit Price Work, the unit cost shall apply to the quantities
      installed per the method of payment described in the General and Supplementary
      Conditions.
   b. Do not perform Work until selection of alternate has been approved in writing by
      the Owner.
   c. Provide actual invoices for the materials.

1.02 SUBMITTALS
   A. Provide submittals for materials furnished as part of the bid option in accordance with
      Section 01 33 00 “Submittal Procedures.”

1.03 DESCRIPTION OF BID OPTIONS
   A. Bid Option 1 – Remove and replace metal panel on concrete enclosure on third floor roof.
      1. Base bid provides flashing at enclosure base. Under this option, remove metal panels on
         concrete enclosure and install new panels and framing as shown on the design
         drawings.
      2. Base bid will remove existing asphalt parking lot and concrete curb and provide new in
         existing configuration. Under the option the new parking lot will be in a expanded
         configuration per the design drawings.
      3. Provide lockers and benches in quantity, dimensions and orientation depicted on the
         design drawings for each room.

1.04 DESCRIPTION OF ALLOWANCES
   A. None.

1.05 GUARANTEES
   A. Provide guarantees for products furnished under bid options / proposals or purchased by
      allowances as required by the Contract Documents.

2.00 PRODUCTS (NOT APPLICABLE)

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION
01 27 00  UNIT PRICES

1.00  GENERAL

1.01  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.

1.02  SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

1.03  DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of
   measurement for materials or services added to or deducted from the Contract Sum by
   appropriate modification, if estimated quantities of Work required by the Contract
   Documents are increased or decreased.

1.04  PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance,
   applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that
   requires establishment of unit prices. Methods of measurement and payment for unit
   prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves
   use of established unit prices and to have this work measured, at Owner's expense, by an
   independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections
   referenced in the schedule contain requirements for materials described under each unit
   price.

2.00  PRODUCTS (NOT USED)

3.00  EXECUTION

3.01  LIST OF UNIT PRICES

A. Unit Price No. 1: Deteriorated existing wood blocking or nailer repair/replacement

   1. Description: Provide deteriorated wood blocking and nailer repair or replacement with
      new pressure-treated wood blocking and nailers according to Section 06 10 53
      Miscellaneous Carpentry.

   2. Unit of Measurement: 1 board foot (12”x12”x1” = 1 board foot).

B. Unit Price No. 2: Provide ½” CDX plywood Sheathing repair/replacement
1. Description: Provide ½” plywood sheathing at parapet walls that are in need of repair/replacement of existing gypsum sheathing.

2. Unit of Measurement: 1 square foot (12’x12x1/2” = 1 square foot).

END OF SECTION
1.00 GENERAL

1.01 WORK INCLUDED

A. Furnish equipment, manpower, products, and other items necessary to complete the Project with an acceptable standard of quality and within the Contract time. Construct Project in accordance with current safety practices.

B. Manage Site to allow access to Site and control construction operations.

C. Provide labor, materials, equipment and incidentals necessary to construct temporary facilities to provide and maintain control over environmental conditions at the Site. Remove temporary facilities when no longer needed.

D. Construct temporary impounding works, channels, diversions, furnishing and operation of pumps, installing piping and fittings, and other construction for control of conditions at the Site. Remove temporary controls at the end of the Project.

E. Provide temporary controls for pollutions, management of water and management of excess earth as required in Section 01 50 00 “Temporary Facilities and Controls.”

F. Cost for Project Management and Coordination as described in this section are to be included in the Contract Price.

1.02 QUALITY ASSURANCE

A. Project Superintendent shall be on-site at all times while work is being performed by either general contractor or subcontractor(s).

B. Employ competent workmen, skilled in the occupation for which they are employed. Provide Work meeting quality requirements of the Contract Documents as determined by the Engineer and Owner.

C. Contractor shall not employ any Subcontractor, supplier or other person or organization, whether initially or as a substitute, against whom Owner shall have reasonable objection, including but not limited to failing to meet requirements of background checks, as defined elsewhere in the technical specifications. Owner will communicate such objections in writing within 10 days of receipt of Contractor’s intent to use such Subcontractor, supplier or other person or organization.

D. Contractors shall not employ or substitute Subcontractors without the acceptance of the Owner.

E. Remove defective Work from the Site immediately unless provisions have been made and approved by the Engineer to allow repair of the product at the Site. Clearly mark the Work as "defective" until it is removed or allowable repairs have been completed.

1.03 SUBMITTALS

A. Provide submittals in accordance with Section 01 33 00 “Submittal Procedures.”
1. Provide copies of Supplier’s printed storage instructions prior to furnishing materials or products and installation instructions prior to beginning the installation. Maintain one copy of these documents at the Site until the Project is complete. Incorporate this information into submittals.

2. Incorporate field notes, sketches, recordings, and computations made by the Contractor in Record Drawings.

1.04 STANDARDS

A. Perform Work to comply with local, State and Federal ordinances and regulations.

1.05 SAFETY REQUIREMENTS

A. Assume sole responsibility for safety at the Site. Protect the safety and welfare of persons at the Site.

B. Provide safe access to move through the Site. Provide and maintain barricades, guard rails, covered walkways, and other protective devices to warn and protect from hazards at the Site.

C. Comply with latest provisions of the Occupational Health and Safety Administration and other regulatory agencies in performing Work.

D. Cooperate with accident investigations related to the Site. Provide two copies of all reports, including insurance company reports prepared concerning accidents, injury, or death on the Site to the Owner as Record Data per Section 01 33 00 “Submittal Procedures.”

E. Prior to allowing entry to the site, perform all security screening for personnel per the Uniform General Conditions.

1.06 COORDINATION

A. Coordinate the Work of various trades having interdependent responsibilities for installing, connecting to, and placing equipment in service.

B. Coordinate requests for substitutions to provide compatibility of space, operating elements, effect on the Work of other trades, and on the Work scheduled for early completion.

C. Coordinate the use of Project space and the sequence of installation of equipment, elevators, walks, mechanical, electrical, plumbing, or other Work that is indicated diagrammatically on the Drawings.

1. Follow routings shown for tubes, pipes, ducts, conduits, and other items as closely as practical, with due allowance for available physical space.

2. Utilize space efficiently to maximize accessibility for Owner’s maintenance and repairs.

3. Schematics are diagrammatic in nature. Adjust routing of piping, ductwork, utilities, and location of equipment as needed to resolve spatial conflicts between the various trades. Document the actual routing on the As-built Drawings.

D. Conceal ducts, pipes, wiring, and other non-finish items in finished areas, except as otherwise shown. Coordinate locations of concealed items with finish elements.
E. Coordinate with plans the exact location and dimensioning of items which occur within hung ceilings. Request clarification from the Engineer prior to proceeding with fabrication or installation if a conflict exists.

F. Schedule construction activities in sequence required to obtain best results where installation of one part of the Work is dependent on installation of other components, either before or after its own installation.

G. Sequence, coordinate, and integrate the various elements of mechanical, electrical, and other systems, materials, and equipment. Comply with the following requirements:

   1. Coordinate mechanical and electrical systems, equipment, and materials installation with other building components.

   2. Verify all dimensions by field measurements.

   3. Arrange for chases, slots, and openings in other building components during progress of construction.

   4. Install systems, materials, and equipment as permitted by codes to provide the maximum headroom possible where mounting heights are not detailed or dimensioned.

   5. Coordinate the connection of systems with exterior underground and overhead utilities and services. Comply with the requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

   6. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to the greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Adjust routing of piping, ductwork, utilities, and location of equipment as needed to resolve spatial conflicts between the various trades. Document changes in the indicated routings on the Record Drawings.

   7. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.

   8. Install systems, materials, and equipment to facilitate servicing, maintenance, and repair or replacement of components. As much as practical, connect for ease of disconnecting, with minimum of interference with other installations.

   9. Install access panel or doors where units are concealed behind finished surfaces.

  10. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

1.07 CONTRACTOR’S USE OF SITE

A. Limit the use of Site for Work and storage to those areas designated on the Drawings or approved by the Owner. Coordinate the use of the premises with the Owner.

B. Repair or correct any damage to existing facilities, including contamination, caused by the Contractor’s personnel, visitors, materials, or equipment.

C. Do not permit alcoholic beverages or illegal substances on the Site. Do not allow persons under the influence of alcoholic beverages or illegal substances to enter or remain on the
Site at any time. Persons on Site under the influence of alcoholic beverages or illegal substances will be permanently prohibited from returning to the Site. Criminal or civil penalties may also apply.

D. Park construction equipment in designated areas only and provide spill control measures as discussed in Section 01 50 00 “Temporary Facilities and Controls.”

E. Park employees’ vehicles in designated areas only.

F. Obtain written permission of the Owner and the adjacent private property Owner before entering privately-owned land outside of the Owner’s property, rights-of-way, or easements.

G. Do not allow the use of audio devices, obnoxious, vulgar or abusive language, or sexual harassment in any form. These actions will cause immediate and permanent removal of the offender from the premises. Criminal or civil penalties may apply.

H. Require Workers to wear clothing that is inoffensive and meets safety requirements. Do not allow sleeveless shirts, shorts, exceedingly torn, ripped or soiled clothing to be worn on the project.

I. Do not allow firearms or weapons of any sort to be brought on to the Site under any conditions. No exception is to be made for persons with concealed handgun permits. Remove any firearms or weapons and the person possessing these firearms or weapons permanently and immediately from the Site.

1.08 ACCESS TO THE SITE

A. Maintain access to the facilities at all times. Do not obstruct roads, pedestrian walks, or access to the various buildings, structures, stairways, or entrances. Provide safe temporary walks or other structures to allow access for normal operations during construction.

B. Provide adequate and safe access for inspections. Leave ladders, bridges, scaffolding and protective equipment in place until inspections have been completed. Construct additional safe access if required for inspections.

C. Provide security at the Site as necessary to protect against vandalism and loss by theft.

D. Use State, County, or City roadways for construction traffic only with written approval of the appropriate representatives of each entity. State, County, or City roadways may not all be approved for construction traffic. Obtain written approval to use State, County, City or private roads to deliver pipe and/or heavy equipment to the Site. Copies of the written approvals must be furnished to the Owner as Record Data before Work begins. No additional compensation will be paid because the Contractor is unable to gain access to the easement from public roadways.

1.09 PROPERTY PROVISIONS

A. Make adequate provisions to maintain the flow of storm sewers, sanitary sewers, drains and water courses encountered during the construction. Provide temporary service around the construction or otherwise construct the structure in a manner that the flow is not curtailed. Restore structures which may have been disturbed during construction to their original position as soon as construction in the area is completed.
B. Protect trees, fences, signs, poles, guy wires, and all other property unless their removal is authorized. Restore any property damaged to equal or better condition per Paragraph 1.11 of this Section.

1.10 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. Examine the Site and review the available information concerning the Site. Locate utilities, streets, driveways, fences, drainage structures, sidewalks, curbs, and gutters. Verify the elevations of the structures adjacent to excavations. Report these to the Engineer before beginning construction.

B. Determine if existing structures, poles, piping, or other utilities at excavations will require relocation or replacement. Coordinate Work with Contractor, local utility company and others. Include cost of demolition and replacement, restoration or relocation of these structures in the Cost of Work.

C. Protect buildings, utilities, street surfaces, driveways, sidewalks, curb and gutter, fences, wells, drainage structures, piping, valves, manholes, electrical conduits, and other systems or structures unless they are shown to be replaced or relocated on the Drawings. Restore damage to items to be protected to the satisfaction of the Engineer, utility owner and Owner without additional compensation from the Owner.

D. Carefully support and protect all structures and/or utilities so that there will be no failure or settlement where excavation or demolition endangers adjacent structures and utilities. Do not take existing utilities out of service unless show in the Contract Documents or approved by the Engineer. Notify and cooperate with the utility owner if it is necessary to move services, poles, guy wires, pipelines or other obstructions. Include the cost of relocation and permits required to move existing utilities in the Cost of Work.

E. Protect buildings from damage when handling material or equipment. Protect finished surfaces, including floors, doors, and jambs. Remove doors and install temporary wood protective coverings over jambs.

F. Provide weathertight partition with access doors as indicated on Drawings where exterior walls and windows are being removed/installed. Provide sealer on exposed concrete floors at these areas and remove any water from floors from rain events or construction operations daily.

1.11 DISRUPTION TO SERVICES / CONTINUED OPERATIONS

A. Existing facilities are to continue in service as usual during the construction unless noted otherwise. Owner or utilities must be able to operate and maintain the facilities. Disruptions to existing utilities, piping, process piping, or electrical services shall be kept to a minimum.

1. Do not restrict access to critical valves, operators, or electrical panels.

2. Do not store material or products inside structures.

3. Limit operations to the minimum amount of space needed to complete the specified Work.
4. Maintain storm sewers and sanitary sewers in service at all times. Provide temporary service around the construction or otherwise construct the structure in a manner that the flow is not restricted.
1.12 FIELD MEASUREMENTS

A. Perform complete field measurements for products required to fit existing conditions prior to purchasing products or beginning construction.
B. Verify property lines, control lines, grades, and levels indicated on the Drawings.
C. Verify pipe class, equipment capacities, existing electrical systems and power sources for existing conditions.
D. Check Shop Drawings and indicate the actual dimensions available where products are to be installed.
E. Include field measurements in Record Drawings.

1.13 DELIVERY AND STORAGE

A. Deliver products and materials to the Site in time to prevent delays in construction.
B. Deliver packaged products to Site in original undamaged containers with identifying labels attached. Open cartons as necessary to check for damage and to verify invoices. Reseal cartons and store properly until used. Leave products in packages or other containers until installed.
C. Deliver products that are too large to fit through openings to the Site in advance of the time enclosing walls and roofs are erected. Set in place, raised above floor on cribs.
D. Assume full responsibility for the protection and safekeeping of products stored at the Site.
E. Store products at locations acceptable to the Owner and to allow Owner access to maintain and operate existing facilities.
F. Store products in accordance with the Supplier’s storage instructions immediately upon delivery. Leave seals and labels intact. Arrange storage to allow access for maintenance of stored items and for inspection. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
G. Obtain and pay for the use of any additional storage areas as needed for construction. Store products subject to damage by elements in substantial weather-tight enclosures or storage sheds. Provide and maintain storage sheds as required for the protection of products. Provide temperature, humidity control and ventilation within the ranges stated in the Supplier’s instructions. Remove storage facilities at the completion of the Project.
H. Provide adequate exterior storage for products that may be stored out-of-doors.
   1. Provide substantial platforms, blocking, or skids to support materials and products above ground; slope to provide drainage. Protect products from soiling or staining.
   2. Cover products subject to dislocation or deterioration from exposure to the elements, with impervious sheet materials. Provide ventilation to prevent condensation below covering.
   3. Provide surface drainage to prevent erosion and ponding of water.
   4. Prevent mixing of refuse or chemically injurious materials or liquids with stored materials.
5. Pipes and conduits stored outdoors are to have open ends sealed to prevent the entrance of dirt, moisture, and other injurious materials. Protect PVC pipe from ultraviolet light exposure.

6. Store light weight products to prevent wind damage.

I. Maintain storage facilities. Inspect stored products on a weekly basis and after periods of severe weather to verify that:
   1. Storage facilities continue to meet specified requirements.
   2. Supplier’s required environmental conditions are continually maintained.
   3. Surfaces of products exposed to the elements are not adversely affected.

J. Replace any stored item damaged by inadequate protection or environmental controls.

K. Payment may be withheld for any products not properly stored.

1.14 CLEANING DURING CONSTRUCTION

A. Provide positive methods to minimize raising dust from construction operations and provide positive means to prevent air-borne dust from disbursing into the atmosphere. Control dust and dirt from demolition, cutting, and patching operations.

B. Clean the Project as Work progresses and dispose of waste materials, keeping the Site free from accumulations of waste or rubbish. Provide containers on Site for waste collection. Do not allow waste materials or debris to blow around or off of the Site. Control dust from waste materials. Transport waste materials with as few handlings as possible.

C. Comply with codes, ordinances, regulations, and anti-pollution laws. Do not burn or bury waste materials. Remove waste materials, rubbish and debris from the Site and legally dispose of these at public or private dumping areas.

1.15 CUTTING AND PATCHING

A. Perform cutting, fitting, and patching required to complete the Work or to:
   1. Uncover Work to provide for installation of new Work or the correction of defective Work.
   2. Provide routine penetrations of non-structural surfaces for installation of mechanical, electrical, and plumbing Work.
   3. Uncover Work that has been covered prior to observation by the Engineer.

B. Submit written notification to the Engineer in advance of performing any cutting which affects:
   1. Work of any other Contractor or the Owner.
   2. Structural integrity of any structure or system of the project.
   3. Integrity or effectiveness of weather exposed or moisture resistant structure or systems.
   4. Efficiency, operational life, maintenance, or safety of any structure or system.
   5. Appearance of any structure or surfaces exposed occasionally or constantly to view.
C. The notification shall include:
   1. Identification of the Project.
   2. Location and description of affected Work.
   3. Reason for cutting, alteration, or excavation.
   4. Effect on the Work of any separate contractor or Owner.
   5. Effect on the structural or weatherproof integrity of the project.
   6. Description of proposed Work, including:
      a. Scope of cutting, patching, or alteration.
      b. Trades that will perform the Work.
      c. Products proposed for use.
      d. Extent of refinishing to be performed.
      e. Cost proposal, when applicable.
   7. Alternatives to cutting and patching.
   8. Written authorization from any separate Contractor whose Work would be affected.
   9. Date and time Work will be uncovered or altered.

D. Examine the existing conditions, including structures subject to damage or to movement during cutting or patching.
   1. Inspect conditions affecting installation of products or performance of the Work after uncovering the Work.
   2. Provide a written report of unacceptable or questionable conditions to the Engineer. The Contractor shall not proceed with Work until Engineer has provided further instructions. Beginning Work will constitute acceptance of existing conditions by the Contractor.

E. Protect the structure and other parts of the Work and provide adequate support to maintain the structural integrity of the affected portions of the Work. Provide devices and methods to protect adjacent Work and other portions of the Project from damage. Provide protection from the weather for portions of the Project that may be exposed by cutting and patching Work.

F. Execute cutting and demolition by methods which will prevent damage to other Work and will provide proper surfaces to receive installation of repairs.

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

H. Cut, remove, and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to, the removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the modified Work.

I. Restore Work which has been cut or removed. Install new products to provide completed Work per the Contract Documents.
J. Fit Work air-tight to pipes, sleeves, ducts, conduit, and other penetrations through the surfaces. Where fire rated separations are penetrated, fill the space around the pipe or insert with materials with physical characteristics equivalent to fire resistance requirements of penetrated surface.

K. Patch finished surfaces and building components using new products specified for the original installation.

L. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
   1. For continuous surfaces, refinish to the nearest intersection.
   2. For an assembly, refinish the entire unit.

1.16 PRELIMINARY OCCUPANCY

A. Owner may deliver, install and connect equipment, furnishings, or other apparatus in buildings or other structures. These actions do not indicate acceptance of any part of the building or structure and does not affect the start of warranties or correction periods.

B. Protect the Owner’s property after installation is complete.

C. Owner or Engineer may use any product for testing or determine that the product meets the requirements of the Contract Documents. This use does not constitute acceptance by either the Owner or Engineer. These actions do not indicate acceptance of any part of the product and does not affect the start of warranties or correction periods.

2.00 PRODUCTS

2.01 MATERIALS

A. Provide materials in accordance with the requirements of the individual Sections.

3.00 EXECUTION

3.01 PERFORMANCE OF WORK

A. Perform the Work per the Supplier’s published instructions. Do not omit any preparatory step or installation procedure unless specifically exempted or modified by Change Order, which would be provided by the contractor and approved by the Engineer of Record and the Owner.

END OF SECTION
01 31 13  PROJECT COORDINATION

1.00  GENERAL

1.01  WORK INCLUDED

A. Administer contract requirements to construct the Project. Provide documentation per the requirements of this Section. Provide information as requested by the Engineer or Owner.

1.02  SUBMITTALS

A. Provide submittals in accordance with Section 01 33 00 “Submittal Procedures.”
B. All installed materials and equipment require a submittal.

1.03  COMMUNICATION DURING THE PROJECT

A. The Engineer is to be the first point of contact for all parties on matters concerning this project.
B. The Engineer will coordinate correspondence concerning:
   1. Submittals, including Applications for Payment.
   4. Observation of Work and testing.
   5. Claims.
C. The Engineer will normally communicate only with the Contractor. Any required communication with Subcontractors or Suppliers will only be with the direct involvement of the Contractor.
D. Direct written communications to the Engineer at the address indicated at the Pre-construction Conference. Include the following with communications as a minimum:
   1. Name of the Owner.
   2. Project name.
   4. Project number.
   5. Date.
E. Submit communications on the forms referenced in this Section or in Section 01 33 00 “Submittal Procedures.”

1.04  PROJECT MEETINGS

A. Pre-construction Conference:
   1. Attend a pre-construction conference.
2. The location of the conference will be determined by the Engineer.

3. The time of the meeting will be determined by the Engineer but will be after the Notice of Award is issued and not later than 15 days after the Notice to Proceed is issued.

4. The Owner, Engineer, Contractor’s project manager and superintendent, representatives of utility companies, and representatives from major Subcontractors and Suppliers may attend the conference.

5. Provide and be prepared to discuss:
   a. Preliminary construction schedule.
   b. Preliminary submittal schedule per Section 01 33 00 “Submittal Procedures.”
   c. List of Subcontractors and Suppliers.
   d. Contractor’s organizational chart as it relates to this Project.
   e. Letter indicating the agents of authority for the Contractor and the limit of that authority with respect to the execution of legal documents, contract modifications and payment requests.
   f. Project milestone schedule.

B. Progress Meetings:

1. Attend meetings with the Engineer and Owner.
   a. Meet on a monthly basis or as requested by the Engineer to discuss the Project.
   b. Meet at the Site or other location as designated by the Engineer.
   c. Contractor’s superintendent and other key personnel are to attend the meeting. Other individuals may be requested to attend to discuss specific matters.
   d. Notify the Engineer of any specific items to be discussed a minimum of 1 week prior to the meeting.

2. Provide information as requested by the Engineer or Owner concerning this Project. Prepare to discuss:
   a. Status of overall project schedule.
   b. Contractor’s detailed schedule for the next month.
   c. Anticipated delivery dates for equipment.
   d. Coordination with the Owner.
   e. Status of submittals.
   f. Information or clarification of the Contract Documents.
   g. Claims and proposed modifications to the Contract.
   h. Field observations, problems, or conflicts.
   i. Maintenance of quality standards.
3. Engineer will prepare minutes of meetings. Review the minutes of the meeting and notify the Engineer of any discrepancies within ten days of the date of the meeting memorandum. The minutes will not be corrected after the ten days have expired. Corrections will be reflected in the minutes of the following meeting or as an attachment to the minutes.

C. Pre-submittal and Pre-installation Meetings:
   1. Conduct pre-submittal and pre-installation meetings as required in the individual technical Specifications or as determined necessary by the Engineer.
   2. Set the time and location of the meetings when ready to proceed with the associated Work. Submit a Notification by Contractor in accordance with Paragraph 1.07 for the meeting 2 weeks before the meeting. Engineer and Owner must approve of the proposed time and location.
   3. Attend the meeting and require the participation of appropriate Subcontractors and Suppliers in the meeting.
   4. Prepare minutes of the meeting and submit to the Engineer and Owner for review. Owner and Engineer will review the minutes of the meeting and notify the Contractor of any discrepancies within ten days of the date of the meeting memorandum. The minutes will not be corrected after the ten days have expired. Corrections will be reflected in a revised set of meeting minutes.

1.05 REQUESTS FOR INFORMATION

A. Submit Request for Information (RFI) to the Engineer to obtain additional information or clarification of the Contract Documents.
   1. Submit a separate RFI for each item on the form provided by the Engineer. Engineer will provide this form to contractors at the Pre-Construction Conference.
   2. Attach adequate information to permit a written response without further clarification. Engineer will return requests that do not have adequate information to the Contractor for additional information. Contractor is responsible for all delays resulting from multiple submittals due to inadequate information.
   3. A response will be made when adequate information is provided. Response will be made on the RFI form or in attached information.

B. Response to an RFI is given to provide additional information, interpretation, or clarification of the requirements of the Contract Documents, and does not modify the Contract Documents.

C. Engineer will initiate a Contract Modification Request per Paragraph 1.08 if the RFI indicates that a contract modification is required.

D. Use the Project Issues Log to document decisions made at meetings and actions to be taken in Accordance with Paragraph 1.06.

1.06 PROJECT ISSUES LOG

A. Engineer will maintain a project issues log to document key decisions made at meeting and track action on these issues:
1. Review the log prior to each regular meeting.
2. Report actions taken subsequent to the previous progress meeting on items in the log assigned to the Contractor or through the Contractor to a Subcontractor or Supplier to the Engineer. Report on status of progress 1 week prior to each progress meeting established in Paragraph 1.04 to allow Engineer to update the log prior to the Progress meetings.
3. Be prepared to discuss the status at each meeting.

B. Decisions or action items in the log that require a change in the Contract Documents will have the preparation of a contract modification as an action item if appropriate. The Contract Documents can only be changed by a Change Order.

1.07 NOTIFICATION BY CONTRACTOR

A. Notify the Engineer of:
   1. Need for testing.
   2. Intent to work outside regular working hours.
   3. Request to shut down facilities or utilities.
   4. Proposed utility connections.
   5. Required observation by Engineer or inspection agencies prior to covering Work.
   6. Training.
   7. Need for Supplemental Instructions.

B. Provide notification a minimum of 2 weeks in advance in order to allow Owner and Engineer time to respond appropriately to the notification.

C. Use “Notification by Contractor” form. Engineer will provide this form to the contractor at the Pre-Construction Conference.

   1. A/E will provide an Architect’s Supplemental Instruction (ASI) form to provide any supplemental instructions requested by the contractor.

1.08 REQUESTS FOR MODIFICATIONS

A. Submit a request to the Engineer for any change in the Contract Documents.

   1. Use the “Contract Modification Request” (CMR) form provided by the Engineer. Engineer will provide this form to the contractor at the Pre-Construction Conference.

   2. Assign a number to the Contract Modification Request when issued.

   3. Include with the Contract Modification Request:
      a. A complete description of the proposed modification.
      b. The reason the modification is requested.
      c. A detailed breakdown of the cost of the change (necessary only if the modification requires a change in contract amount). The itemized breakdown is to include:
         1). List of materials and equipment to be installed.
2). Man hours for labor by classification.
3). Equipment used in construction.
4). Consumable supplies, fuels, and materials.
5). Royalties and patent fees.
6). Bonds and insurance.
7). Overhead and profit.
8). Field office costs.
9). Home office cost.
10). Other items of cost.

d. Provide the level of detail outline in the paragraph above for each Subcontractor or Supplier actually performing the Work if Work is to be provided by a Subcontractor or Supplier. Indicate appropriate Contractor mark-ups for Work provided through Subcontractors and Suppliers. Provide the level of detail outline in the paragraph above for self-performed Work.

e. Provide a revised schedule indicating the effect on the critical path for the Project and a statement of the number of days the Project may be delayed by the modification.

4. Submit a Contract Modification Request to the Engineer to request a change order.

5. A Contract Modification Request is required for all substitutions or deviations from the Contract Documents.

6. Engineer will evaluate the request for a contract modification.

B. Owner will initiate changes through the Engineer.

1. Engineer will prepare a description of proposed modifications to the Contract Documents.

2. Engineer will use the Contract Modification Request form. Engineer will assign a number to the Contract Modification Request when issued.

3. Return the Contract Modification Request with a Request for Proposal (RFP) to incorporate the requested change. Include a breakdown of costs into materials and labor in detail outline above to allow evaluation by the Engineer.

C. Owner will issue a Change Order per the General Conditions if a contract modification is appropriate.

1. Modifications to the contract can only be made by a Change Order.

2. Changes in the Project will be documented by a Change Order.

3. Any modifications that require a change can only be approved by Change Order. Changes in Contract Price or Contract Time shall be explicitly detailed in the Change order.

   a. Proposals issued by the Contractor in response to a Contract Modification Request will be evaluated by the Engineer.
b. If a Change Order is recommended, the Owner will prepare the Change Order.
c. The Change Order will be sent to the Contractor and Engineer for execution with a copy to the Owner recommending approval.
d. Change Orders can only be approved by the Texas Military Department’s Executive Director.

1) Work performed on the proposed contract modifications prior to the approval of the Change Order will be performed at the Contractor’s risk.

2) No payment will be made for Work on Change Orders until approved by the Texas Military Department’s Executive Director.

D. The Contractor may be informed that the Contract Modification Request is not approved and construction is to proceed in accordance with the Contract Documents.

1.09 AS-BUILT DRAWINGS

A. Maintain at the site one complete record copy of:

1. Drawings.
2. Specifications.
3. Addenda.
5. Approved Shop Drawings and as-built data.
6. One set of construction photographs.
7. Test records.
8. Clarifications and other information provided in Request for Information and Architect’s Supplemental Instructions (ASI) responses.
9. Reference standards.

B. Store documents and Samples in the Contractor’s field office.

1. Documents are to remain separate from documents used for construction. Do not use these documents for construction.
2. Provide files and racks for the storage of documents.
3. Provide a secure storage space for the storage of Samples.
4. Maintain documents in clean, dry, legible conditions, and in good order.
5. Make documents and Samples available at all times for inspection by the Engineer and Owner.

C. Marking Drawings:

1. Label each document as “as built” in large printed letters.
2. Record information as construction is being performed.
   a. Do not conceal any Work until the required information is recorded.
b. Mark Drawings to record actual construction, including the following:
   1. Depths of various elements of the foundation in relation to finished first floor datum or the top of walls.
   2. Horizontal and vertical locations of underground utilities and appurtenances constructed and existing utilities encountered during construction.
   3. Location of internal utilities and appurtenances concealed in the construction. Refer measurements to permanent structure on the surface. Include the following equipment:
      a). Piping.
      b). Ductwork.
      c). Equipment and control devices requiring periodic maintenance or repair.
      d). Valves, unions, traps, and tanks.
      e). Services entrance.
      f). Feeders.
      g). Outlets.
   4). Changes of dimension and detail.
   5). Changes made by Change Order.
   6). Details not on the original Drawings. Include field verified dimensions and clarifications, interpretations, and additional information issued in response to RFIs.

c. Mark Specifications and Addenda to identify products provided.
   1. Record product name, trade name, catalog number, and each Supplier (with address and phone number) of each product and item of equipment actually installed.
   2. Record changes made by ASI and Change Order in red ink.

d. Mark additional Work or information in erasable pencil.
   1). Use red for new or revised indication.

e. Submit as-built documents to Engineer for review and acceptance 30 days prior to final completion of the Project.
   1). Provide electronic PDF files of each drawing sheet either on one CD or digitally. Provide one (1) copy for distribution to the Owner’s PM, and one (1) copy to the A/E and his consultants.
   2). Provide electronic PDF files of each specification section either on one CD or digitally. Provide one (1) copy for distribution to the Owner’s PM, and one (1) copy to the A/E and his consultants.

D. Applications for process payments will not be recommended for payment if record documents are found to be incomplete, not current or not in order. Final payment will not be made until as-built drawings are submitted and approved by the Engineer and Owner.
2.00 PRODUCTS (NOT APPLICABLE)

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION
01 32 33   PHOTOGRAPHIC DOCUMENTATION

1.00   GENERAL

1.01   WORK INCLUDED

A. All photographs provided under this section and digital copies of these photographs are to become the property of the Owner. Photographs may not be used for publication, or public or private display without the written consent of the Owner.

B. Cost of Photographic Documentation is to be included in the Contractor Construction Phase fee.

1.02   QUALITY ASSURANCE

A. Provide clear photographs taken with proper exposure. View photographs in the field and take new photographs immediately if photos of an adequate print quality cannot be produced. Provide photographs with adequate quality and resolution to permit enlargements.

1.03   SUBMITTALS

A. Submit photographic documentation of existing site and building conditions prior to NTP and beginning construction.

B. Submit photographic documentation of building and site as hidden items are exposed during demolition.

C. Submit photographic documentation as record data in accordance with Section 01 33 00 “Submittal Procedures.”

D. Submit photographic documentation with each payment application.

2.00   PRODUCTS

2.01   PHOTOGRAPHS

A. Provide photographs in digital format with a minimum resolution of 1280 x 960, accomplished without a digital zoom.

B. Take photographs at locations acceptable to the Engineer.

C. Provide two color prints of each photograph and a digital copy of each photograph taken.

D. Identify each print on back with:
   1. Project name.
   2. Date, time, location, and orientation of the exposure.
   3. Description of the subject of photograph.

E. Submit photograph in clear plastic sheets designed for photographs with monthly payment request. Place only one photograph in each sheet to allow the description on the back to be read without removing the photograph.
F. Provide digital copies of picture on a CD for transfer to Owner.

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION
01 33 00    SUBMITTAL PROCEDURES

1.00    GENERAL

1.01    WORK INCLUDED

A. Submit documentation as required by the Contract Documents and as reasonably requested by the Owner and Engineer to:
   1. Record the products incorporated into the Project for the Owner.
   2. Provide information for operation and maintenance of the Project.
   3. Provide information for the administration of the Contract.
   4. Allow the Engineer to advise the Owner if products proposed for the Project by the Contractor conform, in general, to the design concepts of the Contract Documents.

B. Contractor’s responsibility for full compliance with the Contract Documents is not relieved by the Engineer’s review of submittals. Contract modifications can only be approved by Change Order.

1.02    CONTRACTOR’S RESPONSIBILITIES

A. Review and certify all submittals prior to submission.

B. Determine and verify:
   1. Field measurements.
   2. Field construction requirements.
   3. Location of all existing structures, utilities and equipment related to the submittals.
   4. Submittals are complete for their intended purpose.
   5. Conflicts between the submittals related to the various Subcontractors and Suppliers have been resolved.
   6. Quantities and dimensions shown on the submittals.

C. Submit information per the procedures described in this section and the Specifications.

D. Furnish the following submittals:
   1. As specified in the Submittal Schedule below.
   2. Schedules, data and other documentation as described in detail in this section or referenced in the General Conditions and Contract Documents.
   3. Shop Drawings required for consideration of a contract modification.
   4. Submittals as required in the Specifications. Submittals not required will be returned without Engineer’s review.
E. Prior to NTP, Contractor shall submit a schedule/register, organized by specification section, indicating the date submittals will be sent to the Engineer and proposed dates that the product will be incorporated into the Project. Make submittals promptly in accordance with the schedule to cause no delay in the Project. The submittal schedule/register must be approved by the Owner before the first pay application will be accepted.

1. Send submittals to the Engineer allowing for a minimum of 15 days time for delivery, review and marking submittals. Include a minimum of 15 days for review of a resubmission if necessary. Allow adequate time for the submittal review process, ordering, fabrication, and delivery of the product to not delay progress on the Project.

2. Schedule submittal to provide all information for interrelated Work at one time. No review will be performed on submittals requiring coordination with other submittals. Engineer will return submittals for resubmission as a complete package.

3. Contractor shall include the date the submittal was submitted for review, as well as the date the Contractor requests to have the approval finalized, on the submittal register. The Submittal register shall indicate the projected dates for procurement of all included items and shall be updated at least monthly with actual approval and procurement dates.

4. Contractor shall coordinate the Submittal Register with the Work Progress Schedule.

F. Submit information for all of the components and related equipment required for a complete and operational system in the same submittal.

1. Include electrical, mechanical, and other information required to indicate how the various components of the system function.

2. Provide certifications, warranties, and written guarantees with the submittal package for review when they are required.

3. Fabrication or installation of any products prior to the approval of Shop Drawings is done at the Contractor’s risk. Products not meeting the requirements of Contract Documents are defective and may be rejected at the Owner’s option.

G. Payment will not be made for products for which submittals are required until the submittals have been received. Payment will not be made for products for which Shop Drawings or Samples are required until these are approved by the Engineer. Refer to General and Supplementary Conditions for more information on payments.

H. Materials shall not be ordered and work shall not begin without approved submittals.

1.03 QUALITY ASSURANCE

A. Submit legible, accurate, complete documents presented in a clear, easily understood manner. Submittals not meeting these criteria will be returned without review.

B. Demonstrate that the proposed products are in full and complete compliance with the design criteria and requirements of the Contract Documents including Drawings and Specifications as modified by Addenda, Field Orders, and Change Orders.

C. Furnish and install products that fully comply with the information included in the submittal.
1.04 SUBMITTAL PROCEDURES

A. Submit an electronic copy of each submittal via email to the address provided by the Engineer.
   1. The complete contents of each submittal, including associated drawings product data, etc., shall be submitted in searchable Portable Document Format (PDF). Scanned documents are not acceptable. Submit PDF document with adequate resolution to allow documents to be printed in a format equivalent to the document original. Documents are to be scalable to allow printing on standard 8-1/2 x 11 or 11 x 17 papers.
   2. Create and submit color PDF documents where color is important to the evaluation of the submittal and / or where comments will be lost if only black and white PDF documents are provided.

B. Transmit all submittals, with a properly completed Submittal Transmittal Form as provided by the Engineer at the Pre Construction Conference.
   1. Use a separate transmittal form for each specific product, class of material, and equipment system.
   2. Submit items specified in different sections of the Specifications separately unless they are part of an integrated system.

C. Assign a submittal number to the documents originated to allow tracking of the submittal during the review process.
   1. Assign the number consisting of a prefix, a sequence number, and a letter suffix. Prefixes shall be as follows:

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Description</th>
<th>Originator</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP</td>
<td>Application for Payment</td>
<td>Contractor</td>
</tr>
<tr>
<td>CO</td>
<td>Change Order</td>
<td>Engineer</td>
</tr>
<tr>
<td>CMR</td>
<td>Contract Modification Request</td>
<td>Contractor</td>
</tr>
<tr>
<td>CTR</td>
<td>Certified Test Report</td>
<td>Contractor</td>
</tr>
<tr>
<td>EIR</td>
<td>Equipment Installation Report</td>
<td>Contractor</td>
</tr>
<tr>
<td>FO</td>
<td>Field Order/Supplemental Instructions (ASI)</td>
<td>Engineer</td>
</tr>
<tr>
<td>NBC</td>
<td>Notification by Contractor</td>
<td>Contractor</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operation &amp; Maintenance Manuals</td>
<td>Contractor</td>
</tr>
<tr>
<td>PD</td>
<td>Photographic Documentation</td>
<td>Contractor</td>
</tr>
<tr>
<td>RD</td>
<td>Record Data</td>
<td>Contractor</td>
</tr>
<tr>
<td>RFI</td>
<td>Request for Information</td>
<td>Contractor</td>
</tr>
<tr>
<td>RFP</td>
<td>Request for Proposal</td>
<td>Engineer</td>
</tr>
<tr>
<td>SAM</td>
<td>Sample</td>
<td>Contractor</td>
</tr>
<tr>
<td>SD</td>
<td>Shop Drawing</td>
<td>Contractor</td>
</tr>
<tr>
<td>SCH</td>
<td>Schedule of Progress</td>
<td>Contractor</td>
</tr>
</tbody>
</table>
2. Issue sequence numbers in chronological order for each type of submittal.

3. Issue numbers for resubmittals that have the same number as the original submittal followed by an alphabetical suffix indicating the number of times the same submittal has been sent to the Engineer for processing. For example: SD 025 A represents shop drawing number 25 and the letter “A” designates this is the second time this submittal has been sent for review.

4. Clearly note the submittal number on each page or sheet of the submittal.

5. Correct assignment of numbers is essential since different submittal types are processed in different ways.

D. Submit documents with uniform markings.

1. Mark submittals to:
   a. Highlight Contractor’s corrections in green.
   b. Highlight items pertinent to the products being furnished in yellow and delete items that are not when the Supplier’s standard drawings or information sheets are provided.
   c. Cloud items and highlight in yellow where selections by the Engineer or Owner are required.
   d. Mark dimensions with the prefix FD to indicate field verified dimensions on the Shop Drawings.
   e. Provide an 8-by-3-inch blank space for Contractor’s and Engineer’s stamp. Contractor may use a digital certification if this is preferred. The certification must bear a digital signature.

2. Define abbreviations and symbols used in Shop Drawings.
   a. Use terms and symbols in Shop Drawings consistent with the Contract Drawings.
   b. Provide a list of abbreviations and their meaning as used in the Shop Drawings.
   c. Provide a legend for symbols used on Shop Drawings.

E. Mark submittals to reference the Drawing number and/or section of the Specifications, detail designation, schedule or location that corresponds with the data submitted. Other identification may also be required, such as layout drawings or schedules to allow the reviewer to determine where a particular product is to be used.

F. For submittals as required in the specifications, attach the specification section for record data and design drawings for shop drawings at the front of the submittal after the submittal transmittal form. The Contractor shall initial each sheet (with a PDF writing software) of the specification section and/or design drawing to confirm that the submittal complies with the requirements of the contract documents. The Contractor shall comply with all requirements in sections 1.08 through 1.10 for substitutions. The Contractor shall identify any minor discrepancy or clarification on the attached specification and/or design drawing.

G. Provide one record data and/or one shop drawing for each specification section that contains all required submittals per the requirements of the specification section.
1.05 REVIEW PROCEDURES

A. Shop drawings are reviewed in the order received, unless Contractor request that a different priority be assigned.

B. Mark a submittal as “Priority” to place the review for this submittal ahead of submittals previously delivered. Priority submittals will be reviewed before other submittals for this Project which have been received but not reviewed. Use discretion in the use of “Priority” submittals as this may delay the review of submittals previously submitted. Revise the Schedule of Contractor’s Submittals for substantial deviations from the previous schedule.

C. Review procedures vary with the type of submittal as described in Paragraph 1.06.

1.06 SUBMITTAL REQUIREMENTS

A. Shop Drawings are required for those products that cannot adequately be described in the Contract Documents to allow fabrication, erection or installation of the product without additional detailed information from the Supplier.

1. Certify on the Contractor’s stamp that the Contractor has reviewed the Shop Drawings and made all necessary corrections such that the products, when installed, will be in full compliance with the Contract Documents. Shop Drawings submitted without this certification will be returned without review.

2. Submit Shop Drawings for:
   a. Products indicated in the submittal schedule following this section.
   b. When a substitution or equal product is proposed in accordance with Paragraph 1.08 of this Section.

3. Include a complete description of the material or equipment to be furnished. Information is to include:
   a. Type, dimensions, size, arrangement, model number, and operational parameters of the components.
   b. Weights, gauges, materials of construction, external connections, anchors, and supports required.
   c. Performance characteristics, capacities, engineering data, motor curves, and other information necessary to allow a complete evaluation of mechanical components.
   d. All applicable standards such as ASTM or Federal specification numbers.
   e. Fabrication and installation drawings, setting diagrams, manufacturing instructions, templates, patterns, and coordination drawings.
   f. Wiring and piping diagrams and related controls.
   g. Complete and accurate field measurements for products which must fit existing conditions. Indicate on the submittal that the measurements represent actual dimensions obtained at the Site.

4. Provide all required statements of certification, guarantees, extended service agreements, and other related documents with the Shop Drawing. The effective date of these documents shall be the date of acceptance of the Work by the Owner.
5. Comments will be made on items called to the attention of the Engineer for review and comment. Any marks made by the Engineer do not constitute a blanket review of the submittal or relieve the Contractor from responsibility for errors or deviations from the Contract requirements.

   a. Submittals that are reviewed will be returned with one or more of the following designations:

      1). Approved: Submittal is found to be acceptable as submitted.

      2). Approved as Noted: Submittal is acceptable with corrections or notations made by Engineer and may be used as corrected.

      3). Revise and Resubmit: Submittal has deviations from the Contract Documents, significant errors, or is inadequate and must be revised and resubmitted for subsequent review.

      4). Not Approved: Products are not acceptable.

   b. Drawings with a significant or substantial number of markings by the Contractor may be marked “Approved as Noted” and “Revise and Resubmit.” These drawings are to be revised to provide a clean record of the submittal.

   c. Dimensions or other data that do not appear to conform to the Contract Documents will be marked as “At Variance With” (AVW) the Contract Documents or other information provided. The Contractor is to make revisions as appropriate to comply with Contract Documents.

B. Certifications, Warranties and Service Agreements include documents as specified in the Specifications, as shown in the submittal schedule or as follows:

   1. Certified Test Reports (CTR): A report prepared by an approved testing agency giving results of tests performed on products to indicate their compliance with the Specifications (refer to Section 01 40 00 “Quality Control.”).

   2. Certification of Local Field Service (CLS): A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300 mile radius of the Site. List names, addresses, and telephone numbers of approved service organizations on or attach it to the certificate.

   3. Extended Warranty (EW): A guarantee of performance for the product or system beyond the normal 1 year warranty described in the General Conditions. Issue the warranty certificate in the name of the Owner.

   4. Extended Service Agreement (ESA): A contract to provide maintenance beyond that required to fulfill requirements for warranty repairs, or to perform routine maintenance for a definite period beyond the warranty period. Issue the service agreement in the name of the Owner.

   5. Certification of Adequacy of Design (CAD): A certified letter from the manufacturer of the equipment stating that they have designed the equipment to be structurally stable and to withstand all imposed loads without deformation, failure, or adverse effects to the performance and operational requirements of the unit. The letter shall state that mechanical and electrical equipment is adequately sized to be fully operational for the conditions specified or normally encountered by the product’s intended use.
C. Submit record data to provide information to allow the Owner to adequately identify the products incorporated into the Project and allow replacement or repair at some future date.

1. Provide record data for all products per the submittal schedule. Record data is not required for items for which Shop Drawings and/or operations and maintenance manuals are required.

2. Provide information only on the specified products. Submit a Contract Modification Request for approval of deviations or substitutions and obtain approval by Field Order or Change Order prior to submitting record data.

3. Provide the same information required for Shop Drawings.

4. Record data will be received by the Engineer, logged, and provided to Owner for the Project record.
   a. Record data may be reviewed to see that the information provided is adequate for the purpose intended. Inadequate drawings may be returned as unacceptable.
   b. Record data is not reviewed for compliance with the Contract Documents. Comments may be returned if deviations from the Contract Documents are noted during the cursory review performed to see that the information is adequate.

D. Submit Operation and Maintenance manuals (O&M) for all equipment, mechanical devices, or components described in the Contract Documents per Section 01 78 23 “Operation and Maintenance Data.” Include copies of approved Shop Drawings in the manual.

E. Submit Request for Information (RFI) in accordance with Section 01 31 13 “Project Coordination.”

F. Submit a Schedule of Values and Application for Payment (AP) in accordance with the General and Supplementary Conditions.

G. Submit Progress Schedules (SCH) in accordance with General and Supplementary Conditions.

H. Submit Certified Test Reports (CTR) from independent testing laboratories in accordance with Section 01 400 00 “Quality Control”.
   1. Submit test reports for material fabricated for this Project with Shop Drawings for that product.
   2. Submit test reports produced at the point of production for standard production products with the record data for that product.

I. Submit a list of Suppliers and Subcontractors as record data in accordance with Section 01 31 13 “Project Coordination.”

J. Submit Notifications by Contractor (NBC) in accordance with Section 01 31 13 “Project Coordination.”

1.07 SUBMITTALS REQUIRED FOR THIS PROJECT

A. Furnish the following Submittals:
   1. Schedules, data and other documentation as described in detail in this section or referenced in the General Conditions.
2. Documentation required for the administration of the Contract.
4. Contractor shall submit submittal register for approval by Owner.

1.08 REQUESTS FOR DEVIATION
A. Submit requests for deviation from the Contract Documents for any product that does not fully comply with the Contract Documents.
B. Submit request by Contract Modification Request (CMR) per Section 01 31 13 “Project Coordination.” Identify the deviations and the reason the change is requested.
C. Include the amount if cost savings to the Owner for deviations that result in a reduction in cost.
D. A Change Order or Field Order will be issued by the Engineer for deviations approved by the Owner. Deviations from the Contract Documents may only be approved by Change Order or Field Order.

1.09 SUBMITTALS FOR EQUAL NON SPECIFIED PRODUCTS
A. The products of the listed suppliers are to be furnished where Specifications list several manufacturers but do not specifically list “or equal” or “or approved equal” products. Use of any products other than those specifically listed is a substitution and must be approved per Paragraph 1.09.
B. Contractor may submit other manufacturers’ products that are in full compliance with the specification where Specifications list one or more manufacturers followed by the phase “or equal” or “or approved equal.”

1. Submit Shop Drawings of adequate detail to document that the proposed product is equal or superior to the specified product.
2. Prove that the product is equal. It is not the Engineer’s responsibility to prove the product is not equal.
   a. Indicate on a point by point basis for each specified feature that the product is equal to the Contract Document requirements.
   b. Make a direct comparison with the specified manufacturer’s published data sheets and available information. Provide this printed material with the submittal.
   c. The decision of the Engineer regarding the acceptability of the proposed product is final.
3. Provide a typewritten certification that, in furnishing the proposed product as an equal, the Contractor:
   a. Has thoroughly examined the proposed product and has determined that it is equal or superior in all respects to the product specified.
   b. Has determined that the product will perform in the same manner and result in the same process as the specified product.
   c. Will provide the same warranties and/or bonds as for the product specified.
d. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the product into the construction and will waive all claims for additional Work which may be necessary to incorporate the product into the Project which may subsequently become apparent.

e. Will maintain the same time schedule as for the specified product.

4. A modification request is not required for any product that is in full compliance with the Contract Documents.

1.10 SUBMITTALS FOR SUBSTITUTIONS

A. Substitutions are defined as any product that the Contractor proposes to provide for the Project in lieu of the specified product.

B. Submit the following for consideration of approval of a Supplier or product which is not specified:

1. Contract Modification Request for deviation from the Contract Documents per Paragraph 1.08.

2. Prove that the product is acceptable as a substitute. It is not the Engineer’s responsibility to prove the product is not acceptable as a substitute.
   a. Indicate on a point by point basis for each specified feature that the product is acceptable to meet the intent of the Contract Documents requirements.
   b. Make a direct comparison with the specified Suppliers published data sheets and available information. Provide this printed material with the submittal.
   c. The decision of the Engineer regarding the acceptability of the proposed substitute product is final.

3. Provide a written certification that, in making the substitution request, the Contractor:
   a. Has determined that the substituted product will perform in substantially the same manner and result in the same ability to meet the specified performance as the specified product.
   b. Will provide the same warranties and/or bonds for the substituted product as specified or as would be provided by the Manufacturer of the specified product.
   c. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the substituted product into the Project and will waive all claims for additional Work which may be necessary to incorporate the substituted product into the Project which may subsequently become apparent.
   d. Will maintain the same time schedule as for the specified product.

C. Pay engineering cost for review of substitutions.

1. Cost for additional review time will be billed to the Contractor for the actual hours required for the review and marking of Shop Drawings by Engineer and in accordance with the rates listed in section 1.13 of this specification.

2. Cost for the additional review shall be paid to the Engineer by the Contractor on a monthly basis.
1.11 WARRANTIES AND GUARANTEES

A. Submit sample warranties and guarantees required by the Contract Documents with the Shop Drawings and product submittals. Submit executed warranties and guarantees with closeout documents.

B. Provide additional copies of ALL warranties and guarantees for equipment and include this additional copy in the Operation and Maintenance Manuals. Refer to Section 01 78 23 “Operation and Maintenance Data.”

C. Provide a separate manual for warranties and guarantees.
   1. Provide a log of all products for which warranties or guarantees are provided, and for all equipment. Index the log by Specification section number on forms provided by the Engineer.
   2. Indicate the start date, warranty or guarantee period and the date upon which the warranty or guarantee expires for products or equipment for which a warranty or guarantee is required.
   3. Indicate the date for the start of the correction period specified in the General Conditions for each piece of equipment and the date on which the specified correction period expires.
   4. Provide a copy of the warranty or guarantee under a tab indexed to the log.

1.12 RESUBMISSION REQUIREMENTS

A. Make all corrections or changes in the submittals required by the Engineer and resubmit until approved.

B. For Shop Drawings:
   1. Revise initial drawings or data and resubmit as specified for the original submittal.
   2. Highlight in yellow those revisions which have been made in response to the first review by the Engineer.
   3. Highlight in blue any new revisions which have been made or additional details of information that has been added since the previous review by the Engineer.

C. Pay for excessive review of Shop Drawings.
   1. Excessive review of Shop Drawings is defined as any review required after the original review has been made and the first resubmittal has been checked to see that corrections have been made.
   2. Cost for additional review time will be billed to the Contractor by the Engineer for the actual hours required for the review and marking of Shop Drawings by Engineer and in accordance with the rates listed in contract.
   3. Pay cost for the additional review to the Engineer on a monthly basis as billed by the Engineer.
   4. Need for more than one resubmission or any other delay of obtaining Engineer’s review of submittals, will not entitle the Contractor to an extension of Contract Time. All costs associated with such delays shall be at the Contractor’s expense.
1.13 ENGINEER’S STANDARD RATES

A. Should it be necessary for the A/E firm to engage in the excessive review of Shop Drawings, the A/E employee’s time shall be billed at the following rates:

<table>
<thead>
<tr>
<th>Position</th>
<th>Hourly Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Architect</td>
<td>$235.00</td>
</tr>
<tr>
<td>Associate Architect</td>
<td>$167.00</td>
</tr>
<tr>
<td>Technical/Draftsman</td>
<td>$101.00</td>
</tr>
<tr>
<td>Administrative</td>
<td>$76.00</td>
</tr>
</tbody>
</table>

1.14 ENGINEER’S DUTIES

A. Review the submittals and return with reasonable promptness.
B. Affix stamp, indicate approval, rejection, and the need for resubmittal.
C. Distribute documents.

2.00 PRODUCTS (NOT APPLICABLE)

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION
1.00 GENERAL

1.01 DESCRIPTION

A. An Envelope Preconstruction meeting shall be held with all of the subcontractors responsible for erecting the envelope related materials.

B. Work includes: Constructing mock up, including all reviewed submittals required by the Contract Documents, to establish compliance with the design intent as well as the specified requirements to provide a complete and water tight facility.

C. Providing a photo manifest of as built conditions as the mock is being constructed. Photos to be kept at the job site during construction for reference.

D. Mock up fabrication must be completed and reviewed and approved by the Owner and Architect prior to starting installation of envelope material.

1.02 QUALITY ASSURANCE

A. Coordination of product submittals and construction installation:

1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.

2. Verify that each item being submitted is in conformance in all respects with the specified requirements.

3. By affixing the Contractor's signature to each submittal for the mock up, the contractor certifies that this coordination has been performed.

4. Contractor shall construct the site built mock up with the same manner of specified construction as the new construction.

5. Contractor shall construct the site built mock up with the same workmanship and quality as being implemented on the new construction.

6. All material to be installed shall be reviewed by architect and consultants for conformance.

2.00 PRODUCTS

2.01 MOCK UP REQUIREMENTS

A. Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Mockups construction shall be coordinated by the General Contractor and constructed by the subcontractor responsible for the actual construction work. All conditions and materials to be used on the job shall be included in the mockup. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

B. Contractor shall start the construction of the mock up based on, but not limited to, the following list:
1. Waterproofing membrane
2. Damproofing material
3. Flexible Through Wall Flashing Membrane
4. Metal Through Wall Flashing
5. Preformed Flashing Pieces
6. Weather Barrier
7. Portland Cement Plaster
8. Window Unit

C. Samples and Manufacturer’s Submittals: Submit prior to delivery or installation.
   1. Samples of all building system components including all specified accessories.
   2. Submit samples of proposed warranties complete with any addenda necessary to meet the warranty requirements as specified.
   3. Submit latest edition of manufacturer’s specifications and installation procedures. Submit only those items applicable to this project.
   4. A written statement from the materials manufacturer approving the installer, specifications and drawings as described and/or shown for this project and stating the intent to guarantee the completed project.
   5. Follow submitted shop drawings, product data of all sheet metal.

D. Scale and measurements: Make Shop Drawings accurately to a scale sufficiently large enough to show all pertinent aspects of the item and its method of connection to the work.

E. Shop Drawings and product data: Provide manufacturer’s approved details of all conditions, projection conditions, and any additional special job conditions which require details other than indicated in the drawings.
   1. Manufacturer’s Details: All termination details and other details normally required by the manufacturer’s Technical Specifications, including both standard details and special details, shall be furnished by the Contractor and shall be approved in writing by the manufacturer, the company project manager, and the Owner’s representative prior to final installation.

F. Provide manufacturer’s approved details, of all perimeter conditions, project conditions, and any additional special job conditions which require details other than indicated in the drawings.

2.02 MANUFACTURER’S LITERATURE

A. Work provided on the mock up shall follow all of the submitted literature from manufacturers.

B. Manufacturer’s literature shall be the minimum for basis of design and shall be in conjunction with construction documents. All Manufacturers warranties shall remain in effect as specified.
2.03 SAMPLES

A. Provide sample or samples identical to the precise article proposed to be provided.

2.04 COLORS AND PATTERNS

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

B. Contractor shall coordinate with Architect for exact layout or design of patterns and textures and how they are to be installed on the mock up.

3.00 EXECUTION

3.01 INSTALLATION OF MATERIALS

A. Contractor shall install all materials on mock up in same manner required for the main structure. Refer to specification sections for basis of design of all material being installed on this mock up.

B. Contractor shall maintain a photo manifest of mock up construction for Architect and Owner to review.

C. Quality of installation is of utmost importance and shall be monitored for completeness and conformance.

D. Once mock up is complete, it shall be reviewed by the Architect and Owner’s Representative for conformance to construction documents.

E. Contractor shall install material in same sequencing as required by industry standards.

3.02 INSTALLATION OF WINDOWS AND ASSOCIATED FLASHING

A. Installer shall coordinate the installation of the window with associated trades to maintain proper compatibility of material.

B. Installation shall be in accordance with referencing specifications.

C. Install all perimeters flashing as detailed to create a sealed and watertight condition.

D. Once window and flashing has been installed, Contractor shall notify Architect, Owner and Consultants for review for conformance and shall provide a water test of all wall flashing. Contractor shall notify Architect, Owner and Consultants to observe the testing. All tests shall be in accordance with referencing specifications.

3.03 INSTALLATION OF FLASHING AT THROUGH WALL LOCATION

A. Installer shall coordinate the installation of the wall flashing with associated trades to maintain proper compatibility of material.

B. Installation shall be in accordance with referencing specifications.

C. Once flashing has been installed, Contractor shall notify Architect, Owner and Consultants for review for conformance and shall provide a water test of all wall flashing. Contractor
shall Notify Architect, Owner and Consultants to observe the testing. All tests shall be in accordance with referencing specifications.

END OF SECTION
01 40 00  QUALITY CONTROL

1.00  GENERAL

1.01  SUMMARY

A. This section includes the following

1. Requirements for Contractor’s quality control operations, including testing.

2. Owner’s quality assurance activities, including testing.

3. Material Testing requirements for all tests, whether by Owner or Contractor.

1.02  CONTRACTOR’S RESPONSIBILITIES

A. Control the quality of work produced and verify that the work performed meets the standards of quality established in the Contract Documents.

1. Inspect the work performed by the Contractor, subcontractors and suppliers. Correct defective work.

2. Inspect products to be incorporated into the project. Provide only those products that comply with the Contract Documents.

3. Verify conformance of the work and products with the Contract Documents before notifying the Owner of need for testing.

4. Provide consumable construction materials of adequate quality to provide a finished product that complies with the Contract Documents.

5. Provide and pay for the services of an approved professional materials testing laboratory to insure that products proposed for use fully comply with the Contract Documents.

6. Perform tests as indicated in this and other sections of the specifications. Schedule the time and sequence of testing with the Owner and Architect. Owner shall determine location of area/item to be tested.

7. Testing is to be observed by the Owner, Architect, or designated representative.

8. Provide labor, materials, tools, equipment, and related items for testing by the Owner including, but not limited to temporary construction required for testing and operation of new and existing utilities.
B. Provide Certified Test Reports on products or constructed works to be incorporated into the project as required by Section 01 30 00, SUBMITTALS. Reports are to indicate that products or constructed works are in compliance with the Contract Documents.

C. Provide and maintain a written Quality Control Program that establishes the methods of assuring compliance with the Contract Documents.

D. Designate Quality Control personnel at the start of the project. These personnel shall have the authority to monitor the work effectively and to implement and enforce the Quality Control Program.

E. Assist the Architect, Owner, and Owner's testing organization to perform quality assurance activities.

1. Provide access to the work and to the Manufacturer's operations at all times work is in progress.

2. Cooperate fully in the performance of sampling, inspection, and testing.

3. Furnish labor and facilities to:
   a. Provide access to the work to be tested.
   b. Obtain and handle samples for testing at the project site or at the source of the product to be tested.
   c. Facilitate inspections and tests.
   d. Store and cure test samples.

4. Furnish copies of the tests performed on products.

5. Provide adequate quantities of representative product to be tested to the laboratory at the designated location.

6. Give the Owner adequate notice before proceeding with work that would interfere with testing.

7. Notify the Architect and the testing laboratory prior to the time that testing is required. Lead time is to be adequate to allow arrangements to be made for testing.

8. Do not proceed with any work until testing services have been performed and results of tests indicate that the work is acceptable.

9. Provide complete access to the site and make Contract Documents available.

10. Provide personnel and equipment needed to perform sampling or to assist in making the field tests.

11. Testing performed by the Owner will be paid for by the Owner.
F. Provide a recognized testing laboratory capable of performing a full range of testing procedures complying with the standards or testing procedures specified. Obtain Owner's approval for the testing laboratory before testing is performed.

G. Provide personnel certified to perform the test required.

H. Should requirements of this Section of the specification conflict with the requirements of the detailed specifications, the technical specifications shall govern.

1.03 SUBMITTALS

A. Submittals shall be in accordance with Section 01 30 00, SUBMITTALS, and shall include:

1. The name of the proposed testing laboratory along with documentation of qualifications, a list of tests that can be performed, and a list of recent projects for which testing has been performed with references from those projects.

2. Test reports per Paragraph 1.07, TEST REPORTS of this specification.

1.04 NON-CONFORMING WORK

A. Immediately correct any work that is not in compliance with the Contract Documents or submit a written explanation of why the work is not to be corrected immediately and when the corrective work will be performed.

B. Payment for non-conforming work shall be withheld until work is brought into compliance with the Contract Documents.

1.05 MATERIAL TESTING REQUIREMENTS FOR CONTRACTOR/OWNER

A. General

1. Testing performed by the Owner will be paid for by the Owner.

2. Testing performed by the Contractor will be paid for by the Contractor.

1.06 STANDARDS

A. Provide a testing laboratory that complies with the ACIL (American Council of Independent Laboratories) "Recommended Requirements for Independent Laboratory Qualifications".

B. Perform testing per recognized test procedures as listed in the various sections of the specifications, standards of the State Department of Highways and Public Transportation, American Society of Testing Materials (ASTM), or other testing associations. Perform tests in accordance with published procedures for testing issued by these organizations.
1.07 DELIVERY AND STORAGE

A. Handle and protect test specimens of products and construction materials at the construction site in accordance with recognized test procedures.

1.08 VERIFICATION TESTING

A. Provide verification testing when tests performed by the Owner indicate that materials or the results of construction activities are not in conformance with Contract Documents.

B. Verification testing is to be provided at the Contractor's expense to verify products or constructed works are in compliance after corrections have been made.

C. Tests must comply with recognized methods or with methods recommended by the Owner's testing laboratory and approved by the Architect.

1.09 TEST REPORTS

A. Test reports are to be prepared for all tests.

1. Tests performed by testing laboratories may be submitted on their standard test report forms. These reports must include the following:

   a. Name of the Owner, project title and number, equipment installer and general contractor.
   b. Name of the laboratory, address, and telephone number.
   c. Name and signature of the laboratory personnel performing the test.
   d. Description of the product being sampled or tested.
   e. Date and time of sampling, inspection, and testing.
   f. Date the report was issued.
   g. Description of the test performed.
   h. Weather conditions and temperature at time of test or sampling.
   i. Location at the site or structure where the test was taken.
   j. Standard or test procedure used in making the test.
   k. A description of the results of the test.
   l. Statement of compliance or non-compliance with the Contract Documents.
   m. Interpretations of test results, if appropriate.
B. Distribute copies of the test reports to:

<table>
<thead>
<tr>
<th>No. of Copies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner 2</td>
</tr>
<tr>
<td>Architect 1</td>
</tr>
<tr>
<td>Contractor 1</td>
</tr>
</tbody>
</table>

1.10 LIMITATION OF AUTHORITY OF THE TESTING LABORATORY

A. The testing laboratory representatives are limited to providing consultation on the test performed and in an advisory capacity.

B. The testing laboratory is not authorized to:

1. Alter the requirements of the contract documents.
2. Accept or reject any portion of the work.
3. Perform any of the duties of the Contractor.
4. Stop the work.

1.11 QUALITY ASSURANCE ACTIVITIES BY THE OWNER

A. Quality assurance activities of the Owner and Architect through their own forces or through contracts with materials testing laboratories and survey crews are for the purpose of monitoring the results of the Contractor’s work to see that it is in compliance with the requirements of the Contract Documents.

1. Quality assurance activities of the Owner and Architect in no way relieves the Contractor of the obligation to perform work and furnish products and constructed work conforming to the Contract Documents.

2. Failure on the part of the Owner or Architect to perform or test products or constructed works in no way relieves the Contractor of the obligation to perform work and furnish materials conforming to the Contract Documents.

2.00 PRODUCTS

2.01 TESTING APPARATUS

A. Furnish testing apparatus and related accessories necessary to perform the tests.
3.00 EXECUTION

A. Refer to individual specification sections for additional testing requirements.

END OF SECTION
**01 50 00 TEMPORARY FACILITIES AND CONTROLS**

**1.00 GENERAL**

**1.01 WORK INCLUDED**

A. Furnish temporary facilities, including the Contractor’s field offices, storage sheds, and temporary utilities needed to complete the work. Refer to specification 01 11 00 “Summary of Work” for more information on temporary utilities.

B. The contractor shall be responsible for arranging and paying for all utilities during construction until final completion or when Owner takes beneficial occupancy, whichever comes first. In no case shall the Owner pay for utilities between NTP and Substantial Completion.

C. Furnish temporary heating and cooling system for the buildings once finishes begin being applied if the permanent system is not operational. Contractor is responsible for locating and installing this system.

D. Furnish, install, and maintain temporary project identification signs. Provide temporary on-site informational signs to identify key elements of the construction facilities. Do not allow other signs to be displayed.

E. Cost for Temporary Facilities and Controls as described in this section and provided by Suppliers and Subcontractors as described in this section are to be included in the Cost of Work. Contractor efforts are included in the Contractor’s fee for Construction Phase Services.

**1.02 QUALITY ASSURANCE**

A. Testing: Inspect and test each service before placing temporary utilities in use. Arrange for all required inspections and tests by regulatory agencies, and obtain required certifications and permits for use.

**1.03 DELIVERY AND STORAGE**

A. Arrange transportation, loading, and handling of temporary buildings and sheds.

**1.04 JOB CONDITIONS**

A. Locate buildings and sheds at the Site as indicated or as approved by the Owner.

B. Prepare the Site by removing debris and performing demolition needed to clear a space adequate for the structures.

C. Contractor is responsible for temporary restrooms facilities. If contractor chooses to have a temporary facility, contractor shall pay for the utilities used by temporary facilities during construction.

D. Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in the performance of the Work.

E. Maintain, expand as required, and modify temporary services and facilities as needed throughout the progress of the Work.
F. Operate temporary facilities in a safe and efficient manner.
   1. Restrict loads on temporary services or facilities to within their designed or designated capacities.
   2. Provide sanitary conditions. Prevent public nuisance, or hazardous conditions from developing or existing at the Site.
   3. Prevent freezing of pipes, flooding, or the contamination of water.
   4. Maintain site security and protection of the facilities.

1.05 OPTIONS
   A. Construction offices may be prefabricated buildings on skids or mobile trailers.
   B. Storage sheds may be prefabricated buildings on skids or truck trailers.

2.00 PRODUCTS

2.01 SIGN MATERIALS
   A. Provide new or used signs, wood or metal with structure and framing in sound condition. Materials are to be structurally adequate and suitable for the indicated finish.

2.02 TEMPORARY STORAGE BUILDINGS
   A. Furnish storage buildings of adequate size to store any materials or equipment delivered to the Site that might be affected by weather.

2.03 TEMPORARY SANITARY FACILITIES
   A. Provide sanitary facilities at the Site from the commencement of the Project until project conclusion. Maintain these facilities in a clean and sanitary condition at all times, and comply with the requirements of the local health authority.
   B. Use these sanitary facilities. Do not use rest rooms within existing or Owner-occupied buildings.

3.00 EXECUTION

3.01 LOCATION OF TEMPORARY FACILITIES
   A. Locate all temporary facilities in areas approved by the Owner. Construct and install signs at locations approved by the Owner. Install informational signs so they are clearly visible.

3.02 TEMPORARY LIGHTING
   A. Provide portable flood lights at any time that Work will be performed outside the structure at night. Provide adequate lighting to provide sufficient light at any location Work is being performed.
   B. Work outside the hours or 7:00 a.m. to 6:00 p.m. will not normally be permitted. Obtain prior authorization from the Owner and Engineer for any night Work.
C. Provide Security light for the building entrance and secure parking areas at night.

3.03 CONSTRUCTION FENCE

A. Install and maintain a construction fence around the construction site and/or around the storage yard as indicated. Fence must be a minimum 6 feet high and may be wood picket or chain link construction. Provide gates with padlocks.

3.04 REMOVAL OF TEMPORARY FACILITIES

A. Remove temporary buildings, sheds, and utilities at the conclusion of the Project and restore the Site to original condition or finished in accordance with the Drawings.

B. Remove informational signs upon completion of construction.

C. Remove project identification signs, framing, supports, and foundations upon completion of the Project.

END OF SECTION
01 73 29   CUTTING AND PATCHING

1.00   GENERAL

1.01   SUMMARY

A. Section Includes:
   1. Requirements and limitations for cutting and patching of Work.

1.02   SUBMITTALS

A. Submit written request in advance of cutting or alteration, which affects:
   1. Structural integrity of any element of Project.
   2. Efficiency, maintenance, or safety of any operational element.
   4. Work of Owner or separate contractor.

B. Include in request:
   1. Identification of Project.
   2. Location and description of affected work.
   3. Necessity for cutting or alteration.
   4. Description of proposed work, and Products to be used.
   5. Alternatives to cutting and patching.
   6. Effect on work of Owner or separate contractor.
   7. Date and time work will be executed.

2.00   PRODUCTS

2.01   MATERIALS

A. Primary Products: Those required for original installation.

B. Product Substitution: For any proposed change in materials, submit request for substitution.

3.00   EXECUTION

3.01   EXAMINATION

A. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

B. After uncovering existing Work, inspect conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.
3.02 PREPARATION

A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.

3.03 CUTTING AND PATCHING

A. Using a wet concrete saw, cut concrete floors to demolish or remove concrete or to remove or install electrical conduit, plumbing piping or any other system or device. Do not use jack hammers to demolish concrete flooring. Dust control is a crucial component of this effort. Obtain and comply with dust control procedures of the Owner.

B. Execute cutting, fitting, and patching to complete Work.

C. Fit Products together, to integrate with other work.

D. Uncover work to install ill-timed work.

E. Remove and replace defective or non-conforming work.

F. Provide openings in the Work for penetration of mechanical and electrical work.

G. Protect the structure and other parts of the work and provide adequate support to maintain the structural integrity of the affected portions of the work. Provide devices and methods to protect adjacent work and other portions of the project from damage. Provide protection from the weather for portions of the project that may be exposed by cutting and patching work.

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

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

J. Cut, remove, and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to, the removal of piping, ductwork, and other items made obsolete by the modified work. The Owner desires to retain ownership of any removed salvageable scrap metal. At the Owner’s Representative’s discretion, transport any removed salvageable scrap metal to the Owner’s onsite salvage location. Refer to 01 74 19 “CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT”.

K. Restore work which has been cut or removed. Install new products to provide completed work per the Contract Documents. Patch/repair all penetrations in fire rated partitions (regardless of whether it opening is a result of demolition or existing conditions) and all penetrations, flaws or defects resulting from demolition activities.

L. Fit work air-tight to pipes, sleeves, ducts, conduit, and other penetrations through the surfaces. Where fire rated separations are penetrated, fill the space around the pipe or insert with materials with physical characteristics equivalent to fire resistance requirements of penetrated surface.

M. Patch finished surfaces and building components using new products specified for the original installation.
N. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
   1. For continuous surfaces, refinish to the nearest intersection.
   2. For an assembly, refinish the entire unit.

3.04 PERFORMANCE

   A. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.

   B. Restore Work with new products in accordance with requirements of Contract Documents.

   C. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetration through surfaces.

   D. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

END OF SECTION
01 74 19  CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1.00  GENERAL

1.01  RELATED DOCUMENTS

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

1.02  SUMMARY

A. This Section includes administrative and procedural requirements for the following:

   1. Disposing of nonhazardous construction waste.

B. Related Sections include the following:

   1. Division 01 Section "Temporary Facilities and Controls" for environmental-protection
      measures during construction, and location of waste containers at Project site.

1.03  DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste
   resulting from construction, remodeling, renovation, or repair operations. Construction
   waste includes packaging.

B. Disposal: Removal off-site of demolition and construction waste and subsequent sale,
   recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having
   jurisdiction.

1.04  PERFORMANCE GOALS

A. General: Owner's goal is to salvage and recycle as much nonhazardous demolition and
   construction waste as possible including the following materials:

   1. Construction Waste:
      a. Masonry and CMU.
      b. Lumber.
      c. Wood trim.
      d. Metals.
      e. Roofing.
f. Insulation.

g. Piping.

h. Electrical conduit.

i. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1). Paper.

2). Cardboard.

3). Boxes.


5). Polystyrene packaging.


1.05 SUBMITTALS

A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for the Notice to Proceed

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include separate reports for demolition and construction waste. Include the following information:

1. Material category.

2. Generation point of waste.

3. Total quantity of waste in tons.

4. Quantity of waste salvaged, both estimated and actual in tons.

5. Quantity of waste recycled, both estimated and actual in tons.

6. Total quantity of waste recovered (salvaged plus recycled) in tons.

7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. Qualification Data: For Waste Management Coordinator.

I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.06 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management" Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.

2. Review requirements for documenting quantities of each type of waste and its disposition.

3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

5. Review waste management requirements for each trade.
1.07 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Total quantity of waste.

2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.

3. Total cost of disposal (with no waste management).

4. Revenue from salvaged materials.

5. Revenue from recycled materials.


7. Savings in hauling and tipping fees that are avoided.

8. Handling and transportation costs. Include cost of collection containers for each type of waste.

9. Net additional cost or net savings from waste management plan.
2.00  PRODUCTS [NOT USED]

3.00  EXECUTION

3.01  PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.

2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

2. Comply with Division 01 Section "Job Management" for controlling dust and dirt, environmental protection, and noise control.

3.02  RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

4. Store components off the ground and protect from the weather.

5. Remove recyclable waste off Owner’s property and transport to recycling receiver or processor.

3.03 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.


3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.

2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.04 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION
01 74 23   FINAL CLEANING

1.00   GENERAL

1.01   This section specifies administrative and procedural requirements for final cleaning at Substantial Completion, as well as touch up for final inspection.

1.02   WORK INCLUDED

A. Perform a thorough cleaning of the Site, buildings, or other structures prior to Owner occupancy of the buildings, and prior to Final Completion. Leave the Project clean and ready for occupancy.

1.03   SUBMITTALS

A. Provide data for maintenance per Section 01 78 23 “Operation and Maintenance Data.”

1.04   QUALITY CONTROL

A. Use experienced workmen or professional cleaners for final cleaning.

2.00   PRODUCTS

2.01   MATERIALS

A. Furnish the labor and products needed for cleaning and finishing as recommended by the Manufacturer of the surface material being cleaned.

B. Use cleaning products only on the surfaces recommended by the Supplier.

C. Use only those cleaning products which will not create hazards to health or property and which will not damage surfaces.

3.00   EXECUTION

3.01   FINAL CLEANING

A. Thoroughly clean the entire Site.

1. Remove construction debris, boxes, and trash from the Site.

2. Remove construction storage sheds and field offices.

3. Restore grade to match surrounding condition and remove excess dirt.

4. Sweep all drives and parking lots clean of dirt and debris. Use water truck or hose down paved site to like new appearance.

5. Remove temporary erosion control measures and establish suitable ground cover.

B. Clean floors in the construction area or areas affected by construction and inspect for damage.

1. Remove oil, grease, paint drippings, and other contaminants from floors, then mop repeatedly until thoroughly clean. Replace damaged flooring.
2. Clean resilient flooring with an approved cleaner and provide one coat liquid floor polish as recommended by the flooring Supplier. Polish to a buffed appearance with powered floor buffer.

3. Vacuum all carpets with powered floor sweeper to remove dirt and dust. Remove glue or other substances from nap of carpet.

C. Clean wall surfaces to remove dirt or scuff marks. Remove excess adhesive along top edges of wall base. Remove adhesive from surfaces of vinyl wall coverings.

D. Align tile to fit properly in grid and replace cracked or damaged tile. Remove smear marks and other dirt from tile and clean surface of grid system.

E. Spot paint nicks and other damage. If spot-painting does not blend into the existing color and texture of the surrounding surfaces, repaint wall from inside corner to inside corner. Touch up damaged surfaces on factory finished equipment using special paint furnished by the Manufacturer.

F. Remove dirt, oil, grease, dust and other contaminants from floors, equipment and apparatus in mechanical and electrical rooms with vacuum.

G. Clean permanent filters and replace disposable filters on heating, ventilating, and air conditioning systems. Clean ducts, blowers, and coils if units were operated without filters during construction.

H. Clean roof areas of debris; flush roof drainage systems with water until clear.

I. Broom clean exterior paved surfaces and rake clean other surfaces of the grounds.

J. Clean and polish all electrical equipment and exposed conduits. Remove paint overspray. Provide a blemish free appearance on all exposed equipment and conduits.

END OF SECTION
1.00 GENERAL

1.01 WORK INCLUDED

A. Prepare three (3) complete and detailed Operation and Maintenance Manuals for each type and model of equipment or product furnished and installed under this Contract.

B. Prepare the manuals in the form of an instruction manual for the Owner. The manual is to be suitable for use in providing operation and maintenance instruction as required by Section 01 75 00 “Starting and Adjusting.”

C. Provide complete and detailed information specifically for the products or systems provided for this Project. Include the information required to operate and maintain the product or system.

D. Manuals are to be in addition to any information packed with or attached to the product when delivered. This information is to be taken from the product and provided as an attachment to the manual.

E. Cost for O&M Manuals provided by Suppliers and Subcontractors as described in this section are to be included in the Cost of Work. Contractor efforts are included in the Contractor’s fee for Construction Phase Services.

1.02 SUBMITTALS

A. Submit manuals in accordance with Section 01 33 00 “Submittal Procedures.”

1.03 GUARANTEES

A. Provide copies of the Manufacturer’s warranties, guarantees, or service agreements.

2.00 PRODUCTS

2.01 MATERIALS

A. Print manuals on heavy, first quality paper.
   1. Paper shall be 8-1/2 x 11 paper.
      a. Reduce drawings and diagrams to 8-1/2 x 11 paper size.
      b. When reduction is not practical, fold drawings and place each separately in a clear, super heavy weight, top loading polypropylene sheet protector designed for ring binder use. Provide a typed identification label on each sheet protector.
   2. Punch paper for standard three-ring binders with a 13/32” diameter punch.

B. Place manuals in Wilson Jones 385 Line D-Ring Dublock Presentation Binders.
   1. Binders are to have clear front, back, and spine covers.
   2. Sheet lifters are to be provided.
   3. Minimum size is 2-inch capacity. Maximum size is 3-inch capacity.
C. Provide tab indexes for each section of the manual.
   1. Indexes are to be constructed of heavy-duty paper with a reinforced binding edge and punched with 9/32-inch holes to fit the binders.
   2. Index is to have clear insertable tabs for a typed insert.

2.02 ELECTRONIC MANUAL FORMAT

A. Manual contents to be provided on compact disc (CD).
   1. Minimum CD storage capacity is 700 MB.
   2. CD to have read/write capability.

B. Provide individual electronic files for each manual.
   1. Maximum file size is 5MB. If manual is greater than maximum allowable file size, provide individual files for each major section of manual.
   2. Acceptable file types for written documents are Portable Document File (PDF) or Microsoft Word formats. Acceptable file types for drawing files are PDF formats. All files shall be compatible with the latest software version available.
   3. Filename shall identify the plant site, plant area, equipment manufacturer, and date equipment placed in service. i.e. WWTP-PC1-Manufacturer-200503.pdf.
   4. Each electronic file shall contain a table of contents at the beginning of the file which includes hypertext links or bookmarks to navigate the file contents per section/chapter.
   5. Scanned images of written documents are not acceptable. Document must allow character selection. Text within a file shall be transferable to other documents.
   6. Drawing files shall have the ability to turn on/off drawing layers within the file.
   7. Submit a preliminary version of the electronic format of the manual for review prior to requesting substantial completion. Upon approval of the preliminary submittal, the Contractor shall provide three copies of the electronic manual to the Owner.

3.00 EXECUTION

3.01 MANUAL ORGANIZATION AND CONTENTS

A. Provide a Table of Contents listing each section of the manual for each product or system.
   1. Identify each product or system using the nomenclature shown in the Contract Documents.
   2. Assign a number and letter to each section in the manual.
      a. Assign a number to each product or system. The number is to correspond to the Owner’s equipment numbering system or other system designated by the Engineer.
      b. A cross reference is to be provided for the Owner’s numbering system and designations for equipment indicated in the Contract Documents.
      c. The letter assigned will represent the part of the manual, consistent with the manual contents as required by Paragraphs 3.02, 3.03, and 3.04.
3. Provide index tabs for each section in the manual.

4. The designation on each index tab is to correspond to the number and letter assigned in the Table of Contents.

B. Include only the information that pertains to the product described. Annotate each sheet to:
   1. Clearly identify the specific product or component installed.
   2. Clearly identify the data applicable to the installation.
   3. Delete reference to inapplicable information.

C. Supplement manual information with drawings as necessary to clearly illustrate relations of component parts of equipment and systems, and control and flow diagrams.

D. Identify each manual by placing a printed cover sheet in the front cover of the binder and as the first page in the manual. The first page is to be placed in a clear polypropylene sheet protector. The information on first page and the cover page are to include:
   1. Name of Owner.
   2. Project Name.
   3. Volume number.
   4. The Table of Contents for that volume.

E. Insert the Table of Contents into the spine of each manual.

F. Manuals for several products or systems may be provided in the same binder.
   1. Sections for each product or system must be included in the same binder.
   2. Sections must be in numerical order from volume to volume.

G. Correlate the data into related groups when multiple binders are used.

H. Fill binders to only three-fourths of its indicated capacity to allow for addition of materials to each binder by the Owner.

3.02 EQUIPMENT AND SYSTEMS MANUAL CONTENT

A. Manual shall provide the following information:
   1. A description of the unit and component parts.
   2. Operating instructions for startup, normal operations, regulation, control, shutdown, emergency conditions, and limiting operating conditions.
   3. Maintenance instructions including assembly, installation, alignment, adjustment, and checking instructions.
   4. Lubrication schedule and lubrication procedures. Include a cross reference for recommended lubrication products.
   5. Troubleshooting guide.
   6. Schedule of routine maintenance requirements.
   7. Description of sequence of operation by the Control Manufacturer.
8. Warnings for detrimental maintenance practices.

9. Parts lists including:
   a. Part numbers for ordering new parts.
   b. Assembly illustrations showing an exploded view of the complex parts of the product.
   c. Predicted life of parts subject to wear.
   d. List of the Manufacturer’s recommended spare parts, current prices with effective date and number of parts recommended for storage.
   e. Directory of a local source of supply for parts with company name, address, and telephone number.
   f. Complete nomenclature and list of commercial replacement parts.

10. Outline, cross section and assembly drawings, engineering data, test data, and performance curves.

11. Control schematics and point to point wiring diagrams prepared for field installation, including circuit directories of panel boards and terminal strips.

12. List of identification nameplates installed on equipment and valve identification per the Contract Documents.

13. Other information as may be required by the individual sections of the Specifications.

14. Copies of approved submittals related to equipment in O&M manuals.

3.03 ELECTRICAL AND ELECTRONICS SYSTEMS MANUAL

A. Manual shall provide the following information:
   1. A description of the systems and component parts.
   2. Control schematics and point to point wiring diagrams prepared for field installation. Include circuit directories of panel boards and terminal strips and as installed color coded wiring diagrams.
   3. Operating procedures, maintenance procedures, and the Manufacturer’s printed operating and maintenance instructions.
   4. List of the Manufacturer’s recommended spare parts, current prices with effective date, and number of parts recommended for storage.
   5. Other information as may be required by the individual sections of the Specifications.
   6. Final balancing reports for mechanical systems.
   7. Other information as may be required by the individual sections of the Specifications.
3.04 LIST OF SERVICE ORGANIZATIONS

A. Provide a directory of authorized service organizations with company name, address, telephone number, e-mail address and the contact person for warranty repair.

END OF SECTION
DIVISION 2
SITEWORK
02 41 19  SELECTIVE DEMOLITION

1.00  GENERAL

1.01  RELATED DOCUMENTS

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

1.02  SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.

1.03  DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store.
C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04  MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.05  PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.
1.06 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property for environmental protection. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner’s on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner’s continuing occupancy of portions of existing building and of Owner’s partial occupancy of completed Work.

C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 01 32 33 “Photographic Documentation.” Submit before Work begins.

1.07 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.08 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner’s operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner will remove the following items:
   a. Moveable furniture.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.
2.00 PRODUCE

2.01 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

3.00 EXECUTION

3.01 EXAMINATION

A. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
   1. Comply with requirements specified in Section 01 32 33 “Photographic Documentation.”
   2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
   3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
      c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.03 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas. Provide temporary weather partition as indicated on Drawings with weathertight access doors.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.

5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 “Temporary Facilities and Controls.”

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

5. Maintain fire watch during and for at least 2 hours after flame-cutting operations.


7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner’s storage area designated by Owner.
   5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers. Items shall not be stored in the University Center building.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.
3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI’s “Recommended Work Practices for the Removal of Resilient Floor Coverings”.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 74 19 “Construction Waste Management and Disposal.”
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   4. Comply with requirements specified in Section 01 74 19 “Construction Waste Management and Disposal.”

B. Burning: Do not burn demolished materials.

3.07 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION
DIVISION 4
MASONRY
04 01 00  MASONRY REPAIR/RESTORATION/REBUILDING

1.00  GENERAL

1.01  SECTION INCLUDES

A. Removal, salvage and Replacement of brick units at rise wall.

1.02  REFERENCE STANDARDS


B. BIA Brick Industry Association/Brick Institute of America – Technical Notes.

1.03  ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

   1. Require attendance of parties directly affecting work of this section.

   2. Review conditions of installation, installation procedures, and coordination with related work.

1.04  SUBMITTALS

A. See Section 01 30 00 – Administrative Requirements, for submittal procedures.

B. Samples: Submit four samples of face brick units to illustrate matching color, texture and extremes of color range.

C. Manufacturer’s Instructions: For cleaning materials, indicate special procedures, conditions requiring special attention.

D. Test reports: Original mortar analysis.

1.05  QUALITY OF ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.

   1. Maintain one copy of each document on project site.

B. Preconstruction Testing Laboratory Services:

   1. Remove minimum of 2 unweathered, undisturbed, full depth mortar samples at each rise wall. Size shall be 6 inches wide, full depth. Retain one sample for comparison to proposed mortar mixes.

   2. Test mortar in accordance with ASTM C1324, report the following

      a. Volumetric proportions of aggregate, cement, lime and other ingredients.

      b. Type, composition, color and gradation of aggregate.

      c. Presence of pigments or additives.
d. Based on test results provide recommended mortar mix for each masonry system in accordance with ASTM C270, compatible with physical and mechanical properties of original masonry materials.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

1.07 FIELD CONDITIONS
A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

2.00 PRODUCTS

2.01 MORTAR MATERIALS
A. Portland Cement:
   1. ASTM C150, Type I
   2. Color: To match original masonry.
   3. Provide non-staining Portland cement complying with staining requirement of ASTM C91 for not more than 0.03 percent water soluble alkali for stonework and other masonry.
B. Hydrated Lime: ASTM C207, Type S.
C. Mortar Aggregate: ASTM C144.
D. Water: Clean and free of oil, acids, alkalis, and organic matter.

2.02 MASONRY MATERIALS
A. Units to match existing shape, size, color, texture, and material conforming to ASTM C216, Grade SW.
B. Building Brick Concealed from View: Provide building brick complying with ASTM C62 of same vertical dimension as face brick.
C. Colored Mortar Aggregate:
   1. Natural or manufactured, hand selected to produce mortar color.
   2. Provide sand with rounded edges for pointing mortar.
   3. Match size, texture, and gradation of existing mortar as closely as possible as approved by the Owner's Representative.
D. Colored Mortar Pigment:
   1. Natural and synthetic iron oxides and chromium oxides, compounded for us in mortar mixes.
   2. Use only pigments with record of satisfactory performance in masonry mortars.
3. Match color of existing mortar as approved by the owner's Representative.

2.03 MORTAR MIXES

A. Measurement and Mixing:
   1. Measure cementitious and aggregate materials in dry conditions by volume or equivalent weight.
   2. Do not measure by shovel; use known measure.
   3. Mix materials in clean mechanical batch mixer.

B. Mixing Repair Mortar:
   1. Thoroughly mix cementitious and aggregate materials together before adding water.
   2. Mix again adding only enough water to produce damp, unworkable mix which will retain its form when pressed into ball.
   3. Maintain mortar in this dampened condition for one to two hours.
   4. Add remaining water in small portions until mortar of desired consistency is reached.
   5. Use mortar within thirty (30) minutes of final mixing.
   6. Do not re-temper or use partially hardened material.

C. Admixtures: Do not use admixtures in mortar

3.00 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to be cleaned are ready for work of this section.

3.02 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.
B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.
C. Separate areas to be protected from restoration areas using means adequate to prevent damage.
D. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

3.03 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.
B. Support structure as necessary in advance of cutting out units.
C. Cut away loose or unsound adjoining masonry as directed.
D. Build in new units following procedures for new work specified in other section(s).
E. Mortar Mix: Colored and proportioned to match existing work.
F. Ensure that anchors are correctly located and built in.
G. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.04 CLEANING

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.
B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.
C. Clean surrounding surfaces.

END OF SECTION
05 50 00 METAL FABRICATIONS

1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Steel framing and supports for mechanical and electrical equipment.
   2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   3. Miscellaneous steel trim including steel edgings.
   4. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section:
   1. Loose steel lintels.
   2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
   3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 F (67 C), ambient; 180 F (100 C), material surfaces.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Paint products.
   2. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.06 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, “Structural Welding Code - Steel.”
3. AWS D1.6, “Structural Welding Code - Stainless Steel.”

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.08 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers’ written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. 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.

2.00 PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A36.
C. Stainless-Steel Sheet, Strip, and Plate: ASTM A240 or ASTM A666, Type 304.
D. Stainless-Steel Bars and Shapes: ASTM A276, Type 304.
E. Steel Tubing: ASTM A500, cold-formed steel tubing.
F. Steel Pipe: ASTM A53, standard weight (Schedule 40) unless otherwise indicated.

2.03 NONFERROUS METALS


2.04 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners for fastening aluminum.
   2. Provide stainless-steel fasteners for fastening stainless steel.
B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.
D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
   1. Hot-dip galvanized or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
E. Eyebolts: ASTM A489.
F. Machine Screws: ASME B18.6.3.
G. Lag Screws: ASME B18.2.1.
H. Wood Screws: Flat head, ASME B18.6.1.
K. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
L. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.
M. Post-Installed Anchors: Torque-controlled expansion anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.


2.05 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

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

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

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

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

2.06 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. 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. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. 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.
F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

2.07 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from 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.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.08 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from 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.
   1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim as noted.

D. Prime miscellaneous steel trim with zinc-rich primer.

2.09 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 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.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   4. Other Items: SSPC-SP 3, “Power Tool Cleaning.”

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, “Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel,” for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend 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. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.13 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
3.00 EXECUTION

3.01 INSTALLATION, GENERAL

A. 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.

B. 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.

C. 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.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

3.02 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.

3.03 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded 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 dry film thickness.
B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Load-bearing wall framing.
   3. Ceiling joist framing.

B. Related Sections include the following:
   1. Section 05 50 00 “Metal Fabrications” for masonry shelf angles and connections.
   2. Division 09 Section “Non-Structural Metal Framing” for ceiling-suspension assemblies.
   3. Section 09 21 16.23 “Gypsum Board” gypsum board.

1.03 DEFINITIONS

A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.

B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing for the entire project capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated and as required by IBC 2006 for all framing.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Exterior Wall Framing: Horizontal deflection of 1/600 of the wall height.
      b. Interior Wall Framing: Horizontal deflection of 1/240 of the wall height.
   3. Design framing systems to provide for movement of framing members without damage or over stressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 F (67 C).
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate dead, live, and wind load deflection of primary building structure. Coordinate with pre-engineered metal building manufacturer. At a minimum provide design for, but not less than that required by design:
   a. Upward and downward live load only movement of 1-1/2 inches.
   b. Accommodation of dead load movements shall be as required by design.

B. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. The member spacing shown on the drawings is to be considered a maximum. Actual spacing may need to decrease based on the design.

1.05 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.

C. Record Data: For cold-formed metal framing, include structural analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

D. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

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.

G. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
   1. Expansion and/or adhesive anchors.
   2. Power-actuated anchors.
   3. Concrete screw anchors.
   4. Mechanical fasteners.
   5. Vertical deflection clips.
   6. Miscellaneous structural clips and accessories.

H. 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.

1.06 QUALITY ASSURANCE
A. 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.

B. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings, and other structural data.

C. 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.

D. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.

E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 to conduct the testing indicated, as documented according to ASTM E548.


G. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.


H. AISI Specifications: Comply with AISI’s “Specification for the Design of Cold-Formed Steel Structural Members” for calculating structural characteristics of cold-formed metal framing:


1.07 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.

2.00 PRODUCTS

2.01 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:

1. Clark Steel Framing Industries.
2. Dietrich Industries, Inc.
3. MarinoWare; Div. of Ware Industries, Inc.

2.02 MATERIALS

A. Steel Sheet: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: 33 minimum, but not less than that required by design.
   2. Coating: G60.

2.03 WALL FRAMING

A. Steel Studs: Manufacturer’s standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C955, and as follows:
   1. Minimum Uncoated-Steel Thickness: As required by design.
   2. Minimum Flange Width: As required by design.
   3. Member Depth: Coordinate with drawings.

B. Steel Track: Manufacturer’s standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, complying with ASTM C955, and as follows:
   1. Minimum Uncoated-Steel Thickness: Matching steel studs.
   2. Minimum Flange Width: As required by design.

C. 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 as follows:
   1. Minimum Uncoated-Steel Thickness: As required by design.
   2. Flange Width: As required by design.

D. Double Deflection Tracks: Manufacturer’s double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
   1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads, and as follows:
      a. Minimum Uncoated-Steel Thickness: As required by design.
      b. Flange Width: As required by design.
   2. Inner Track: Of web depth indicated, and as follows:
      a. Minimum Uncoated-Steel Thickness: As required by design.
      b. Flange Width: As required by design.

E. Vertical Deflection Clips: Manufacturer’s standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure.

2.04 CEILING JOIST FRAMING
A. **Steel Ceiling Joists**: Manufacturer’s standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C955, and as follows:
   1. **Minimum Uncoated-Steel Thickness**: As required by design.
   2. **Minimum Flange Width**: As required by design.

2.05 **FRAMING ACCESSORIES**

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi (230 MPa).

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. End clips.
   5. Foundation clips.
   7. Stud kickers, knee braces, and girts.
   8. Joist hangers and end closures.

2.06 **ANCHORS, CLIPS, AND FASTENERS**

A. **Steel Shapes and Clips**: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123.

B. **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.

C. **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 E1190 conducted by a qualified independent testing agency.

D. **Mechanical Fasteners**: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
   1. **Head Type**: Low-profile head beneath sheathing, manufacturer’s standard elsewhere.

E. **Welding Electrodes**: Comply with AWS standards.

2.07 **MISCELLANEOUS MATERIALS**

A. **Galvanizing Repair Paint**: ASTM A780.
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 C1107, with fluid consistency and 30-minute working time.

C. Thermal Insulation: ASTM C665, Type I, unfaced mineral-fiber blankets produced by combining glass or slag fibers with thermosetting resins.

2.08 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer’s written recommendations 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 or screw fastening, 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).

3.00 EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.
3.03 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 ASTM C1007, unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. 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).

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer’s written recommendations and requirements in this Section.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding or screw fastening, 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.

E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

F. 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.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install 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.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer’s standard punched openings.

J. 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.
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.
   2. Provide anchor types that are consistent with design requirements and substrate limitations.

B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
   1. Maximum Stud Spacing: 16 inches, but not more than that required by design.

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 wall-framing continuity is interrupted by floor framing. 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.
   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 the dimension indicated on Shop Drawings apart. Fasten at each stud intersection.

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.
3.05 NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
   1. Anchor Spacing: As shown on Shop Drawings.
   2. Provide anchor types that are consistent with design requirements and substrate limitations.

B. Fasten both flanges of studs to bottom track and top track as required by design. Space studs as follows:
   1. Maximum Stud Spacing: 16 inches, but not more than that required by design.

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. Provide deflection tracks and/or deflection clips as required by design.
   1. Install single deep-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/or infill studs and anchor to primary building structure.

E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 54 inches (1370 mm) apart. Fasten at each stud intersection.

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 curtain-wall-framing system.

3.06 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. Maximum Joist Spacing: 16 inches, but not more than required by design.

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 each end of joists and at intervals indicated on Shop Drawings.

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.

3.07 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Field and shop welds will be subject to inspection and testing.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace Work that does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.08 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 A780 and manufacturer’s written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION
05 50 00    METAL FABRICATIONS

1.00   GENERAL

1.01   RELATED DOCUMENTS

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

1.02   SUMMARY

A. Section Includes:
   1. Steel framing and supports for mechanical and electrical equipment.
   2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   3. Miscellaneous steel trim including steel edgings.
   4. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section:
   1. Loose steel lintels.
   2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
   3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.03   PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 F (67 C), ambient; 180 F (100 C), material surfaces.

1.04   ACTION SUBMITTALS

A. Product Data: For the following:
   1. Paint products.
   2. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
B. Welding certificates.
C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.06 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1, “Structural Welding Code - Steel.”
   3. AWS D1.6, “Structural Welding Code - Stainless Steel.”

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.08 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers’ written recommendations to ensure that shop primers and topcoats are compatible with one another.
B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. 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.

2.00 PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
B. Steel Plates, Shapes, and Bars: ASTM A36.
C. Stainless-Steel Sheet, Strip, and Plate: ASTM A240 or ASTM A666, Type 304.
D. Stainless-Steel Bars and Shapes: ASTM A276, Type 304.
E. Steel Tubing: ASTM A500, cold-formed steel tubing.
F. Steel Pipe: ASTM A53, standard weight (Schedule 40) unless otherwise indicated.

2.03 NONFERROUS METALS


2.04 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners for fastening aluminum.
   2. Provide stainless-steel fasteners for fastening stainless steel.
B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.
D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
   1. Hot-dip galvanized or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
E. Eyebolts: ASTM A489.
F. Machine Screws: ASME B18.6.3.
G. Lag Screws: ASME B18.2.1.
H. Wood Screws: Flat head, ASME B18.6.1.
K. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
L. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.
M. Post-Installed Anchors: Torque-controlled expansion anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.


2.05 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

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

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

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

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

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

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

2.06 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. 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. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. 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.
F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

2.07 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from 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.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.08 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from 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.
   1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim as noted.

D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.09 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 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.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   4. Other Items: SSPC-SP 3, “Power Tool Cleaning.”

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, “Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel,” for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend 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. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.13 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
3.00 EXECUTION

3.01 INSTALLATION, GENERAL

A. 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.

B. 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.

C. 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.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

3.02 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.

3.03 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded 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 dry film thickness.
B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION
DIVISION 6
WOOD AND PLASTIC
06 10 53  MISCELLANEOUS ROUGH CARPENTRY

1.00  GENERAL

1.01  RELATED DOCUMENTS

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

1.02  SUMMARY

A. Section Includes:
   1. Rooftop equipment bases and support curbs.
   2. Wood blocking, cants, and nailers.

1.03  ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. 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 and net amount of preservative retained.
   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 based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.04  INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
   1. Preservative-treated wood.

1.05  QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

2.00 PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

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.

B. Maximum Moisture Content of Lumber: 19 percent of r 2-inch nominal (38-mm actual) thickness or less unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.03 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

2. Nailers.

3. Rooftop equipment bases and support curbs.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.04 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.


D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Metal Framing, length as recommended by screw manufacturer for material being fastened. ASTM C 954

F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

G. 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.

H. 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.


2.05 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

3.00 EXECUTION

3.01 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate
nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

J. Use steel common 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. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.02 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for 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.

3.03 PROTECTION

A. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION
06 16 00  SHEATHING

1.00  GENERAL

1.01  RELATED DOCUMENTS

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

1.02  SUMMARY

A. All sheathing to be delivered to site covered from weather and kept dry while stored.

B. Section Includes:
   1. Wall sheathing.

C. Related Requirements:
   1. Section 06 10 00 “Rough Carpentry” for plywood backing panels.

1.03  ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
   3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.04  INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

   1. Preservative-treated plywood.
   2. Fire-retardant-treated plywood.
   3. Foam-plastic sheathing.
1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

B. Seal all miscellaneous wall penetrations including abandoned holes with sealant and backer rod.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

2.00 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.


B. Glass-Mat Gypsum Wall Sheathing: ASTM C1177/C1177M.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corporation; GlasRoc.
   b. G-P Gypsum Corporation; Dens-Glass Gold.
   c. National Gypsum Company; Gold Bond e(2)XP.
   d. Temple-Inland Inc.; GreenGlass
   e. United States Gypsum Co.; Securock.

2. Type and Thickness: Regular, 1/2 inch (13 mm) thick.

3. Size: 48 by 96 inches (1219 by 2438 mm for vertical installation.

2.02 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.


D. Wood Screws: ASME B18.6.1.
E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C1002.

2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C954.

2.03 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 07 92 00 “Joint Sealants.”

1. Verify type of sealant with sheathing manufacturer.

3.00 EXECUTION

3.01 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.


D. 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. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

H. Manufacturer’s representative shall visit the site once a week during the installation process to assure a uniform, quality and watertight barrier is provided. The manufacturer’s representative shall provide the Owner with a report including photographs for documentation of in place work from each site visit during the duration of the installation.

I. Manufacturer and Contractor to inspect product upon final completion to assure work is free of defects, voids and/or gaps.

J. Contractor shall verify and repair any defects in surfaces that are to receive the damp proofing material prior to installation. The Contractor is to inspect the wall after installation to determine if there are any defective gaps or open material bridging that would not allow the damp proofing to perform as recommended by the manufacturer. Fill all remaining voids with compatible sealer as recommended by manufacturer to create a watertight barrier on the surface of the wall substrate.

K. Refer to Specification Section 01 33 10 Mock up Submittal for additional mock up requirements.

L. Provide Siliconized mastic with reinforcing mesh at all sheathing joints (not adhesive tape).

M. Seal all miscellaneous wall penetrations including abandoned holes with sealant and backer rod.

N. Provide weather proof barrier on the face of the interior substrate sheathing.

3.02 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer’s written instructions.

   1. Fasten gypsum sheathing to cold-formed metal framing with screws.

   2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.

   3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

   1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

E. Seal sheathing joints according to sheathing manufacturer’s written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.

2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION
DIVISION 7
THERMAL AND MOISTURE PROTECTION
1.00 GENERAL

1.01 SUMMARY

A. Section includes the following:
   1. Removal of designated roofing, flashings, unused equipment, and accessories.
   2. Raise rooftop appurtenances where required to achieve minimum recommended
      heights and clearances for new roof installation.

B. Related Sections:
   1. Section 06 10 53 – Miscellaneous Rough Carpentry
   2. Section 07 62 00 – Sheet Metal Flashing and Trim

1.02 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA’s "The NRCA Roofing and
   Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Existing Membrane Roofing System: Existing roofing over concrete deck. Contractors are
   responsible for determining the exact configuration of the existing roofing system(s).

C. Substrate Board: Rigid board or panel products placed over the roof deck that serve as
   thermal barriers, provide a smooth substrate, or serve as a component of a fire-resistance-
   rated roofing system.

D. Roof Tear-Off: Removal of existing membrane roofing system from deck.

E. Remove: Detach items from existing construction and legally dispose of them off-site unless
   indicated to be removed and reinstalled.

F. Existing to Remain: Existing items of construction that are not indicated to be removed.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated, submit product data and general
   recommendations from materials manufacturer for types of materials required. Submit
   manufacturer’s instructions for use and installation of all materials including lightweight
   concrete patching material.

B. Manufacturer Recommendations for temperature range for storage and application of
   materials and any special cold weather application requirements or limitations.

C. Photographs or Videotape: Show existing conditions of adjoining construction and site
   improvements, including exterior and interior finish surfaces that might be misconstrued as
   having been damaged by reroofing operations. Submit before Work begins.

D. Submit an Action and Logistics Plan to Roof Engineer and Facility Manager for review and
   comment prior to start of work. No work will begin until the plan is approved. Include:
1. Site plan with staging areas, roof access, and construction traffic areas identified. Identify where any vehicles or dumpsters will be staged or parked. Also identify where employee vehicles will be parked and restroom will be staged.

2. Construction Schedule including proposed work hours, whether work is scheduled for weekdays or weekends. Provide tentative schedule for any interruption in electrical or mechanical services to the tenant.

3. Provide any utility requirements for the project.

4. Submit proposed methods and operations of roof demolition and reroof procedures and mechanical equipment to be used.

5. Emergency Contact Names and Phone Numbers.

6. Provision made to eliminate odors from disrupting tenant.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in original containers with seals unbroken and labeled with manufacturer’s name, and directions for storage. Packaging labels must be readable, identify the material, and indicate conformance with the reference standard applicable to the material. Additionally, for concrete patch material, labels must indicate the date of manufacture and lot number.

B. Materials requiring fire resistance classification must be delivered to the site with labels from an appropriate independent laboratory attached and packaged as required by the labeling service.

C. Inspect materials delivered to the site for evidence of damage. Reject delivery of damaged materials and materials with stained or wet wrappers or torn covers.

D. Store all temperature sensitive materials within the temperature range recommended by the manufacturer. If exposed to lower temperature, restore to proper temperature before using.

E. Materials to be handled transported and stored in a manner enabling undamaged material to be installed.

F. Use all materials within the time limits prescribed by the manufacturers.

G. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Re-roofing Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:
1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to reroofing preparation, including membrane roofing system manufacturer's written instructions.

3. Review temporary protection requirements for existing roofing system that is to remain, during and after installation.

4. Review roof drainage during each stage of reroofing and review roof drain plugging and plug removal procedures.

5. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

6. Review existing deck removal procedures and Owner notifications.

7. Review procedures to determine condition and acceptance of existing deck for reuse.

8. Review structural loading limitations of deck during reroofing.

9. Review base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect reroofing.

10. Review HVAC shutdown and sealing of air intakes.

11. Review shutdown of fire-suppression, -protection, and -alarm and -detection systems.

12. Review procedures for asbestos removal or unexpected discovery of asbestos-containing materials.

13. Review governing regulations and requirements for insurance and certificates if applicable.

14. Review existing conditions that may require notification of Architect and Owner before proceeding.

1.06 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately below reroofing area. Conduct reroofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

1. Coordinate work activities daily with Owner so Owner can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area if desired.

2. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated prior to proceeding with work over the impaired deck area.

B. Protect building to be re-roofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not block required exits or path from required exit to public right-of-way. Coordinate with requirements of authorities having jurisdiction.

D. Owner assumes no responsibility for condition of areas to be re-roofed.

E. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering into existing roofing system or building.

F. Hazardous Materials: It is not expected that hazardous materials such as asbestos-containing materials will be encountered in the Work.
   1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

G. Observe Owner’s limitations or restrictions for site use and accessibility.

H. Do not close or obstruct hall ways, elevators, doors, roadways or sidewalks without permits.

I. Conduct operations with minimum interference to thoroughfares. Maintain required egress (exit way) and access at all times.

J. Provide, erect, and maintain temporary barriers and security devices.

K. Conduct demolition to minimize interference with adjacent roofing and siding, roof mounted equipment, and roof deck and structure to remain.

L. Remove all abandoned curbs. Fill openings with new steel decking and insulation per the specifications.

M. Conduct demolition and removal operations and coordinate new roofing work to avoid or minimize material and equipment set-up, and movement of equipment and materials over new roofing during construction. Provide temporary protection of new roofing from damage where material and equipment set-up and movement of material and equipment over new roofing cannot be avoided.

N. When roof exceeds one-story or fifteen feet in height, or when debris must be discharged adjacent to windows, pedestrian or vehicular traffic, or where other conditions dictate extra precautions, provide enclosed chute from rooftop to trash containers.

O. Do not remove more existing material than can be replaced with new material or made watertight by the end of the workday.

P. During removal operations, have sufficient and suitable materials on site to facilitate rapid installation of temporary protection in the event of unexpected rain. Do not remove existing materials when precipitation is eminent.

Q. Maintain roof drains in functioning condition to ensure roof drainage at the end of each workday. Prevent debris from entering or blocking roof drains, and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
1. If roof drains will be temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain. Verify that rooftop utilities and service piping have been shut off before commencing work.

1.07 SCHEDULING AND COORDINATION

A. Provide notification to Owner’s Representative a minimum of 48 hours prior to start of work.

B. Schedule and conduct fastener pullout testing before or during Pre-Installation Conference and before selecting fasteners and fastener patterns.

C. Schedule and coordinate all mechanical and electrical service interruptions with Owner's Representative and designate on-site personnel.

D. Coordinate with Owner to shut down air intake equipment in the vicinity of the Work. Cover or filter air intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

E. Schedule work to coordinate with related work of other trades to ensure the continuous water tight roofing system is provided throughout the project.

F. Coordinate the roof removal work with new roofing work in such a manner to keep the new insulation and roofing materials and building interior continuously clean, dry and watertight.

G. Provide a construction progress schedule to the Owner’s Representative in advance of starting construction Work. Verify that occupants of building are notified at least 24 hours prior to commencing work on the building.

H. Confer with the Owner through Roof Engineer regarding the sequencing and phasing of the performance of various parts of the work. Cooperate fully as long as necessary so that certain facilities and services will be maintained in operation until immediately before their removal is required to permit installation of new Work.

I. Submit proposed methods and operations of partial roof demolition for review prior to start of Work.

J. Ensure through protection and good rooftop management practices that traffic and loads imposed on the roof are such that the deck will not be crushed, broken, pulverized, or otherwise damaged in such a manner as to render it unsuitable to receive the roofing system. Any such damage performed by the Contractor, his employees, or subcontractors, will be repaired in a manner acceptable to the Owner.

2.00 PRODUCTS

2.01 DECK AND SUPPORT MATERIALS

A. Curbs and Support Members: Wood or metal curbs and support items as indicated and required for existing conditions.

B. Mechanical Piping and Equipment: Match existing where practical and to meet the current code.
C. Electrical Fixtures and Equipment: Match existing where practical and to meet the current code.

2.02 AUXILIARY REROOFING MATERIALS

A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new membrane roofing system.

B. Metal Flashing Sheet: Metal flashing sheet is specified in Division 7 Section "Sheet Metal Flashing and Trim."

2.03 STRUCTURAL CONCRETE DECK PREP MATERIALS

A. Non-shrinking Grout: Non-shrinking, quick-setting grout shall be used for permanent deck repairs to the structural concrete roof deck.

B. Grout shall be a one component, fiber reinforced, non-shrink cement patch offering high strength and abrasion resistance. Material shall have a one-day compressive strength gain of at least 3,000 psi, and be suitable for use in high humidity, cold and wet conditions.

C. Acceptable products and manufacturers for structural concrete deck repair are the following:
   1. All products must be on site prior to start of construction.
   2. Masterflow 928 as manufactured by Master Builders, Inc., Cleveland OH.
   3. Durapatch Industrial as manufactured by L&M Construction Chemicals, Inc., Omaha, NE.
   4. Quikrete Non-Shrink Precision Grout as manufactured by the Quikrete Companies, Atlanta, GA.
   5. Rapid Set Non-Shrink Multipurpose Grout Cement as manufactured by CTS Cement Manufacturing Company, Atlanta, GA.

2.04 STEEL DECK PREP MATERIALS

A. Steel Decking - Use the following procedures when working on steel or metal decking.
   1. Back-out Screws - All existing screws used to fasten any of the existing roof layers or roof insulation layers are to be backed out using a screw gun or other device or tool acceptable to the Roof Engineer. Screws or other fasteners are not to be pulled through the deck or otherwise forced or broken off.
   2. Clean Deck - Remove all roofing debris left from tear off including sweeping or using a power blower to remove gravel and roofing debris from deck flutes.
   3. Dead Penetrations - Remove all “dead” or unused penetration or equipment flashings as required by the Owner and remove them from the jobsite. Close all equipment or pipe penetration holes as shown in the drawings. Ensure that the hole is closed in such a manner as to meet the structural requirements of the drawings. New decking pieces shall span a minimum of two full bar joists or structural members.
4. Replace Corroded Decking or Rusted Decking - Prior to commencing tear off, replace severely corroded or rusted with new matching decking. Deck is to be screwed or welded into place with side and end laps matching Steel Deck Institute (SDI) specifications for such installation or the drawings in these specifications, whichever is the most stringent.

5. Screw Side Laps - Inspect the steel decking for side-lap and end-lap welding or fastening. Where side laps have not been welded or screwed, or where end or side lap welds have failed, install new self-drilling, self-tapping screws as specified or approved in advance. All side lap fastening is to be at 36” O.C. or as required to meet Factory Mutual 1-120 or UL Class 90 requirements. If primary welds have broken or become broken during roofing work, refasten deck to bar joists or structural members at the proper frequency with approved fasteners.

6. Repair Rust or Corrosion - Where minor or surface rust is visible, such rust is to be wire brushed and painted with rust inhibiting primer before the commencement of roof application.
   a. Rustoleum Rust Primer

7. Paint Screw Holes - Old screw holes shall be painted with rust-inhibiting primer.

2.05 TEMPORARY ROOFING MATERIALS

A. Metal decking cover board:
   2. Size: Maximum 4'-0" by 8'-0".
   3. Characteristics:
      a. Description: Non-structural, mold-resistant gypsum roof board overlayment, with water-resistant inorganic gypsum and cellulose fibers.
      b. Reference standards: Meeting ASTM C1177-06, UL Classified, and FM 1-120 approved.
      c. Thickness: 1/2" USG Securock.
      d. Fire resistance: UL Class A.
      e. Compressive strength: 1800 psi.

B. Cover board fasteners:
   1. Fasteners, General: Factory-coated, #14 shank steel fasteners and 3-inch metal plates meeting corrosion-resistance provisions in FM GLOBAL 4470 and acceptable to roofing-system manufacturer.
   2. Designed for fastening roofing membrane components to substrate and tested by roofing-system manufacturer for required pullout strength.
   3. Cover board shall be fastened to the steel decking with a fastener and plate one every square foot, 32 fasteners per 4 ft. by 8 ft. board. (One fastener every square foot).

C. Temporary roof Membrane over cover board:
1. Firestone Building Products; one ply of APP 160 Smooth Surfaced Ply Sheet torch applied.
2. Johns Manville APEx 4S APP Smooth Surfaced Ply Sheet torched applied.
3. Derbigum Roof Systems; one ply of BITUTAK APP Smooth Surfaced Ply Sheet torched applied.

D. Water Based Asphalt Primer: Karnak 100 Asphalt Emulsion Primer or pre-approved equal.
E. Temporary roof Membrane over primed concrete decks: Provide one of the following:
   1. Soprema Roof Systems; one ply of COLVENT Flam TG Sanded Top Smooth Surfaced Vented Base Sheet torch applied over primed concrete decking.
   2. Siplast Roof Systems; one ply of PARADIENE 20 TS Sanded Smooth Surfaced Vented Base Sheet torch applied over primed concrete decking.

3.00 EXECUTION

3.01 SITE INSPECTION AND FIELD CONDITIONS

A. Verify that areas to be demolished or removed are clear of encumbrances.
B. Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report to the Roof Engineer all conditions that prevent proper execution of this Work.
C. Prior to performing work, inspect all objects designated for removal and protect the limits of demolition. Verify with the Roof Engineer.
D. Locate all active utility lines and provide for their protection. Leave them in operating condition.
E. A certified fastener pull test performed by an independent third party will be required for each roof area and submitted with roofing submittals and must be approved prior to any roof re-cover work commencing.

3.02 SAFETY PRECAUTIONS

A. General:
   1. Installer to follow safety procedures as defined by OSHA and any other applicable governing agencies.
   2. It is the installer’s responsibility to ensure safety at the project work areas at all times.
B. Cease operations and notify Owner immediately if adjacent structures or materials appear to be endangered. Do not resume operation until corrective measures have been taken.

3.03 PROTECTION

A. Lowering material: Provide hoists and enclosed chutes as required to lower removed material. Throwing, dropping, or permitting the free fall of material and debris from heights that would cause damage to work, or to plantings, or cause undue noise or nuisance, or excessive dust, is expressly prohibited.
B. Work to remain: Provide protection as may be necessary to prevent damage to existing equipment.

C. Existing roofing: Protect the existing roof whether scheduled for removal and replacement or not with plywood runways over all equipment or foot traffic areas.

D. Existing decking: During the tear off and demolition operation, the existing deck is to be protected from storage, abuse, impact, or excessive traffic which might tend to damage the decking. Any decking damaged in any of the foregoing ways shall be replaced with matching decking in accordance with the manufacturer’s original installation specifications.

3.04 PREPARATION

A. Prevent movement, or settlement of adjacent structures and paving. Provide bracing and shoring.

B. Protect existing landscaping materials, appurtenances, structures, paving, roofing and siding, roof mounted equipment, roof deck and structures that are not to be demolished.

C. Examine existing mechanical and electrical items to determine existing conditions and operability. Notify Owner’s Representative in writing of any inoperable items or unsafe conditions.

D. Commencing Work indicates acceptance of existing conditions, including operability of mechanical and electrical items.

E. Dead or Unused Penetrations: Cover all equipment or pipe penetration holes as shown in the drawings or as otherwise directed by the Roof Engineer. Ensure that the holes are closed in such a manner as to preclude leakage of primer or hot bitumen through the hole.

F. Abandoned Curbs Remove all abandoned curbs and repair the deck as needed.

G. Concrete Decks: Repair holes larger than 1” in diameter in the concrete deck using non-shrinking, quick-setting grout.

H. Seal Cracks: Where cracks in the deck appear or where cracks between precast members are present, seal all cracks or joints with mastic and membrane using a mastic as specified which will not run into the crack.

I. Structural Concrete Decks: Where tear off of the existing roof has caused spalling or other rough surfaces unsuitable for roofing, the contractor shall apply a trowel thickness of deck repair material over the deck to smooth out or otherwise repair these areas. Prior to the installation of the new roof system the roofing system manufacturer’s representative shall visit the jobsite and observe the uncovered structural concrete and advise the contractor in writing if the deck is acceptable to install the specified roof system. For decks that are not acceptable, the roof systems manufacturer shall issue a written repair protocol to repair the structural concrete deck.

J. Where the roof deck has been wet, damaged, crushed, or is otherwise unsuitable for a roofing substrate, such conditions shall be called to the attention of the Roof Engineer before such area is covered over, and the Roof Engineer shall direct the method of deck repair to be employed.
K. If such damaged decking is covered over with new roofing without the Roof Engineer’s express advance approval, the Roof Engineer reserves the right to require removal and replacement at the Contractor’s expense.

L. All electrical disconnects and re-connects shall be performed by a Texas licensed electrician.

M. All plumbing disconnects and re-connects shall be performed by a Texas licensed lumber.

N. Lightning protection re-installation will be performed by a Texas licensed lightning protection contractor. Once installation is complete, the newly installed lightning protection system shall be certified by a licensed lightning protection contractor.

O. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

P. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. If roof drains will be temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

Q. Verify that rooftop utilities and service piping have been shut off before commencing Work.

3.05 EXECUTION

A. Remove all existing roofing and roof insulation. Remaining concrete or metal decking shall be free of all loose gravel, debris and dust.

B. Demolish or remove roofing and appurtenances in an orderly and careful manner.

C. Limited Daily Tear off: The contractor shall tear off only as much roofing daily as can be replaced securely and completed the same day, or before the onset of inclement weather. All work shall be fully completed daily except for flashing and trim work. However, all work shall be completely weather tight to be free from leaks or water infiltration at the end of each workday.

D. Remove all Loose Gravel: If the roof to be removed has a gravel or ballasted surface, prior to commencing tear off, the contractor shall vacuum all loose gravel and remove it from the roof to prevent tracking loose gravel over the completed membrane. Sweeping or power brooming is not acceptable.

E. Evenly cut edges of existing materials that are to be expanded, replaced, or modified. Completely remove materials from areas to be replaced or repaired each day.

F. Remove materials to be re-installed or retained in a manner to prevent damage.

G. Except when instructed otherwise, immediately remove demolished material from site as work progresses. Remove and properly dispose of contaminated, vermin-infested, or dangerous materials.

H. Modifications to existing mechanical and electrical items:
1. When required to achieve recommended clearances, minimum curb heights, or other modifications, disconnect, modify, and reconnect mechanical and electrical services using qualified and licensed personnel.

2. When required to achieve recommended clearances, minimum curb heights, or other modifications, disconnect, modify, and reconnect lightning protection using qualified and licensed personnel. Once re-installed, the lightning protection system must be certified.

3. Do not disrupt any service unless specifically approved by Owner’s Representative and on-site personnel.

4. Restore services and verify proper operational conditions to satisfaction of Owner’s Representative.

I. Inspect deck after tear-off of membrane roofing system.
   1. Verify that concrete substrate is visibly dry and free of moisture. Do not proceed with roofing work if moisture condenses under the plastic sheet or if asphalt test sample foams or can be easily and cleanly stripped after cooling.

J. If deck surface is not suitable for receiving new roofing, or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.

K. Steel Decking - Use the following procedures when working on steel or metal decking.
   1. Back-out Screws - All existing screws used to fasten any of the existing roof layers or roof insulation layers are to be backed out using a screw gun or other device or tool acceptable to the Roof Engineer. Screws or other fasteners are not to be pulled through the deck or otherwise forced or broken off.

   2. Clean Deck - Remove all roofing debris left from tear off including sweeping or using a power blower to remove gravel and roofing debris from deck flutes.

   3. Dead Penetrations - Remove all “dead” or unused penetration or equipment flashings as required by the Owner and remove them from the jobsite. Close all equipment or pipe penetration holes as shown in the drawings. Ensure that the hole is closed in such a manner as to meet the structural requirements of the drawings. New decking pieces shall span a minimum of two full bar joists or structural members.

   4. Replace Corroded or Rusted Decking - Prior to commencing tear off replace severely corroded or rusted with new matching decking. Deck is to be screwed or welded into place with side and end laps matching Steel Deck Institute (SDI) specifications for such installation or the drawings in these specifications, whichever is the most stringent.

   5. Screw Side Laps - Inspect the steel decking for side-lap and end-lap welding or fastening. Where side laps have not been welded or screwed, or where end or side lap welds have failed, install new self-drilling, self-tapping screws as specified or approved in advance. All side lap fastening is to be at 36” O.C. or as required to meet Factory Mutual 1-120 or UL Class 90 requirements. If primary welds have broken or become broken during roofing work, refasten deck to bar joists or structural members at the proper frequency with approved fasteners.

L. Remove existing base flashings around parapets, curbs, walls, and penetrations.
1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

M. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.

3.06 FASTENER PULL-OUT TESTING (IF REQUIRED)

A. Perform fastener pull-out tests according to SPRI FX-1, and submit test report to Owner before installing new membrane roofing system.

1. Furnish detailed proposal to Owner for revised fastening pattern commensurate with pull-out test results.

3.07 CLEANING AND PROTECTION

A. Daily clean up and removal from the site, of all wrapping, empty containers, loose particles and other debris resulting from these operations is required. Remove any loose materials from the drain. Remove drain protection at the end of each workday and prior to arrival of inclement weather to ensure that all drain lines are open.

B. Schedule sequence of work so that traffic over new membrane is minimized. Institute required procedures for protection of completed membrane during installation of work over membrane and throughout remainder of construction period. Installer to not allow excessive or concentrated traffic over unprotected membrane.

C. Coordinate disposal with requirements of Division 1 Section “Construction Waste Disposal.”

D. Collect and place demolished materials in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site will not be permitted.

E. Transport demolished materials off Owner’s property and legally dispose of them.

END OF SECTION
07 21 00  THERMAL INSULATION

1.00  GENERAL

1.01  RELATED DOCUMENTS

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

1.02  SUMMARY

A. Section Includes:
   1. Glass-fiber blanket insulation.

B. Related Sections:
   1. Division 04 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.
   2. Division 06 Section "Sheathing" for foam-plastic board sheathing over steel framing.
   3. Division 07 Section "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
   4. Division 09 Section(s) "Portland Cement Plastering" for installation in metal-framed assemblies of insulation specified by referencing this Section.

1.03  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 each product.

1.04  QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.05  DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

2.00  PRODUCTS

2.01  GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CertainTeed Corporation.
2. Guardian Building Products, Inc.
5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
   1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
   2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.02 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
      b. Gemco; Spindle Type.
   2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
   3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. AGM Industries, Inc.; TACTOO Adhesive.
      b. Gemco; Tuff Bond Hanger Adhesive.
3.00 EXECUTION

3.01 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer’s written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer’s standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

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. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.04 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches (1219 mm) up either side of partitions.
3.05 ACOUSTICAL WALL INSULATION

A. Manufacturers: Where wall insulation is indicated use one of the following subject to compliance with requirements:

1. Fibrex Insulations Inc.
2. Owens Corning.
3. Roxul Inc.
4. Thermafiber.

B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. Density 4.0 pcf per inch thickness. Thickness 3 inches nominal.

3.06 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION
FLUID-APPLIED MEMBRANE AIR BARRIERS

1.00  GENERAL

1.01  RELATED DOCUMENTS

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

1.02  SUMMARY

A. Section includes fluid-applied vapor-retarding membrane air barriers

B. Related Requirements:
   1. Section 06 16 00 “Sheathing” for wall sheathings and wall sheathing joint-and-penetration treatments.

1.03  DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.04  MOCKUPS

A. Mockups: Install fluid applied membrane in mockups of assemblies specified in other Sections that are indicated to receive membrane specified in this Section. Use materials and installation methods specified in this Section. Include in mockup as shown in construction drawings.

B. Manufacturer’s representative shall visit the site once a week during the installation process to assure a uniform, quality, watertight barrier is provided. The manufacturer’s representative shall provide the Owner with a report including photographs for documentation of in place work from each site visit during the duration of the installation.

C. Manufacturer and Contractor to inspect product upon final completion to assure work is free of defects, voids and/or gaps.

D. Contractor shall verify and repair any defects in surfaces that are to receive the dampproofing material prior to installation. The Contractor is to inspect the wall after installation to determine if there are any defective gaps or open material bridging that would not allow the damp proofing to perform as recommended by the manufacturer. Fill all remaining voids with compatible sealer as recommended by manufacturer to create a watertight barrier on the surface of the wall substrate.

E. Refer to Specification Section 01 33 10 Mock up Submittal for additional mock up requirements.
F. Envelope Preconstruction meeting shall be held with all of the subcontractors responsible for erecting the envelope related materials as well as product technical representatives.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer’s written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.
   1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   2. Include details of interfaces with other materials that form part of air barrier.

1.07 INFORMATIONAL SUBMITTALS

A. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

B. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.08 QUALITY ASSURANCE

A. Mockups: Build mockups to set quality standards for materials and execution.
   1. Build integrated mockups of exterior wall assembly, 150 sq. ft. (14 sq. m), incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
      a. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
      b. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
1.09  PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Contractor shall engage a qualified testing agency to perform preconstruction testing on field mockups.

B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
   1. Qualitative Air-Leakage Testing: Mockups will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.
   2. Quantitative Air-Leakage Testing: Mockups will be tested for air leakage according to ASTM E783.
   3. Adhesion Testing: Mockups will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. (207 kPa) according to ASTM D4541.
   4. Notify Architect 7 days in advance of the dates and times when mockups will be tested.

1.10  DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
B. Protect stored materials from direct sunlight.

1.11  FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
   1. Protect substrates from environmental conditions that affect air-barrier performance.
   2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

2.00  PRODUCTS

2.01  MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

B. Low-Emitting Materials: Air barriers shall comply with the testing and product requirements of the California Department of Health Services’ “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”

2.02  PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa)], when tested according to ASTM E283 or ASTM E783.

2.03 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Elastomeric, Modified Bituminous Membrane
      1). Meadows, W. R., Inc.; Air-Shield LMP.
      2). Dupont Tyvek WB
      3). Tremco Incorporated, an RPM company; ExoAir 220R.
   b. Synthetic Polymer Membrane
      1). Carlisle Coatings & Waterproofing Inc.; Barritech VP.
      2). Grace, W. R., & Co. - Conn.; Perm-A-Barrier VP.
      3). Henry Company; Air-Bloc 31 or Air-Bloc 33.
      4). Rubber Polymer Corporation, Inc.; Rub-R-Wall Airtight VP.
      5). Tremco Incorporated, an RPM company; ExoAir 230.

2. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E2178.
   b. Vapor Permeance: Minimum 10 perms (580 ng/Pa x s x sq. m)); ASTM E96/E96M.
   c. Ultimate Elongation: Minimum 200 percent; ASTM D412, Die C.

2.04 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.

C. Counterflashing Strip: Modified bituminous, 40-mil (1.0-mm) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil (0.2-mm) thick, cross-laminated polyethylene film with release liner backing.

D. Butyl Strip: Vapor retarding, 30 to 40 mils (0.76 to 1.0 mm) thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.

E. Modified Bituminous Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil (0.1-mm) thick polyethylene film with release liner backing.

F. Joint Reinforcing Strip: Air-barrier manufacturer’s glass-fiber-mesh tape.
G. Substrate-Patching Membrane: Manufacturer’s standard trowel-grade substrate filler.

H. Adhesive and Tape: Air-barrier manufacturer’s standard adhesive and pressure-sensitive adhesive tape.

I. Stainless-Steel Sheet: ASTM A240/A240M, Type 304, 0.0250 inch (0.64 mm) thick, and Series 300 stainless-steel fasteners.

J. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb./cu. ft. (24 to 32 kg/cu. m) density; flame-spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

K. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil (0.43-mm) thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance value of 37 perms (2145 ng/Pa x s x sq. m).

L. Elastomeric Flashing Sheet: ASTM D2000, minimum 50- to 65-mil (1.3- to 1.6-mm) thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.

M. Preformed Silicone-Sealant Extrusion: Manufacturer’s standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 123 Silicone Seal.
   c. Pecora Corporation; Sil-Span.
   d. Tremco Incorporated, an RPM company; Spectrem Simple Seal.

N. Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 07 92 00 “Joint Sealants.”

O. Termination Mastic: Air-barrier manufacturer’s standard cold fluid-applied elastomeric liquid; trowel grade.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.

4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer’s written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

A. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C1193 and air-barrier manufacturer’s written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.04 TRANSITION STRIP INSTALLATION

A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer’s written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

2. Install butyl or modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air-barrier assembly within manufacturer’s recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch (150-mm) wide, modified bituminous strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.05 FLUID AIR-BARRIER MEMBRANE INSTALLATION

A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer’s written instructions. Apply fluid air-barrier material within manufacturer’s recommended application temperature ranges.

1. Apply primer to substrates at required rate and allow it to dry.

2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

3. Prime glass-fiber-surfaces gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
1. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil (1.0-mm) dry film thickness, applied in two equal coats.

C. Apply strip and transition strip over cured air-barrier material overlapping 3 inches (75 mm) onto each surface according to air-barrier manufacturer’s written instructions.

D. Do not cover air barrier until it has been tested and inspected by Owner’s testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.06 FIELD QUALITY CONTROL

A. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Site conditions for application temperature and dryness of substrates have been maintained.
4. Maximum exposure time of materials to UV deterioration has not been exceeded.
5. Surfaces have been primed, if applicable.
6. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
7. Termination mastic has been applied on cut edges.
8. Strips and transition strips have been firmly adhered to substrate.
9. Compatible materials have been used.
10. Transitions at changes in direction and structural support at gaps have been provided.
11. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
12. All penetrations have been sealed.

B. Tests: As performed by Contractor’s testing agency from among the following tests:

1. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E783.
2. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. (207 kPa) according to ASTM D4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.

C. Air barriers will be considered defective if they do not pass tests and inspections.
1. Apply additional air-barrier material, according to manufacturer’s written instructions, where inspection results indicate insufficient thickness.

2. Remove and replace deficient air-barrier components for retesting as specified above.

D. Repair damage to air barriers caused by testing; follow manufacturer’s written instructions.

3.07 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer’s written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer’s written instructions.

2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Factory-formed and field-assembled, concealed fastener, lap-seam metal wall panels.

B. Related Sections include the following:
   1. Division 5 Section "Cold-Formed Metal Framing" for secondary support framing supporting metal wall panels.
   2. Division 7 Section "Sheet Metal Flashing and Trim" for fasciae, copings, flashings and other sheet metal work not part of metal wall panel assemblies.
   3. Division 7 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

1.03 DEFINITION

A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight system.

1.04 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration: No water penetration 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 lbf/sq. ft. (300 Pa) and not more than 12 lbf/sq. ft. (575 Pa).

D. Water Absorption: Maximum 1.0 percent absorption rate by volume when tested according to ASTM C 209.

E. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
   1. Wind Loads: Determine loads based on the following minimum design wind pressures:
      a. As indicated.
b. Uniform pressure as indicated on Drawings.

2. Deflection Limits: Engineer metal wall panel assemblies to withstand test pressures with deflection no greater than 1/180 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span.
   a. Test Pressures: 150 percent of inward and outward wind-load design pressures.

F. Thermal Movements: Provide metal wall panel assemblies 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 joint sealants, 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.

1.05 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:

   1. Wall panels and attachments.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

   1. Metal Wall Panels: 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.

      a. Include four-way joint for composite panels.

E. Qualification Data: For Installer.

F. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:

   1. Materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.

   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

G. Field quality-control test reports.
H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:

1. Metal Wall Panels: Include reports for air infiltration, water penetration, and structural performance.

2. Insulation and Vapor Retarders: Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.

I. Research/Evaluation Reports: For metal-faced composite wall panels.

J. Maintenance Data: For metal wall panels to include in maintenance manuals.

K. Warranties: Special warranties specified in this Section.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Installer Qualifications: Fabricator of metal-faced composite wall panels.

1. Installer's responsibilities include fabricating and installing metal wall panel assemblies and providing professional engineering services needed to assume engineering responsibility.

2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

3. Engineering Responsibility: Preparation of data for metal wall panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

C. Fabricator Qualifications: Certified by metal-faced composite wall panel manufacturer to fabricate and install manufacturer's wall panel system.

D. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

E. Source Limitations: Obtain each type of metal wall panel through one source from a single manufacturer.

F. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal wall panels and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

G. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

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 joint sealants to joint substrates.

2. Submit no fewer than nine 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 joint-sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Store metal-faced composite wall panels vertically, covered with suitable weathertight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 deg F (49 deg C).

E. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

F. Protect foam-plastic insulation as follows:
   1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
   3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.08 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal wall panels without field measurements, or allow for field trimming of panels. Coordinate wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.
1.09 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of girts, studs, soffits, and other adjoining work to provide a leak proof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures, including rupturing, cracking, or puncturing.
   b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. 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: 10 years from date of Substantial Completion.

2.00 PRODUCTS

2.01 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. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

3. Basis-of-Design Products: The design for each metal wall panel specified 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.
2.02 PANEL MATERIALS

A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.

2. Surface: Smooth, flat finish.

3. Exposed Finishes: Apply the following coil coating, as specified or indicated on Drawings.

   a. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

      1) Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2604, except as modified below:

4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.03 THERMAL INSULATION FOR FIELD-ASSEMBLED METAL WALL PANELS

A. Refer to Division 7 Section "Thermal Insulation."

2.04 MISCELLANEOUS METAL FRAMING

A. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with manufacturer's standard corrosion-resistant zinc coating.

B. Subgirts: C- or Z-shaped sections fabricated from 0.0598-inch (1.5-mm) bare steel thickness, shop-painted, cold-formed, metallic-coated steel sheet.

C. Zee Clips: 0.079-inch (2.0-mm) bare steel thickness, cold-formed, galvanized steel sheet.

D. Base or Sill Angles 0.079-inch (2.0-mm) bare steel thickness, cold-formed, galvanized steel sheet.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

   1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).

   2. Depth: 7/8 inch (22 mm).

F. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum bare metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.

G. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
2.05 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. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating.

1. Fasteners for Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.

2. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

B. 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.

2.06 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Concealed-Fastener Metal Wall Panels MWP-1: Formed with vertical panel edges and flat pan with flush joints between panels, field assembled with nested lapped edges, and attached to supports using concealed fasteners.

1. Basis-of-Design Product: MBCI FW-120 Panel or a comparable product of one of the following:

2. Manufacturers:
   a. AEP-Span.
   b. ATAS International, Inc.
   c. Berridge Manufacturing Company.
   d. CENTRIA Architectural Systems.
   e. MBCI; Div. of NCI Building Systems.
   f. Metal-Fab Manufacturing, LLC.

3. Material: Zinc-coated (galvanized) steel sheet, 0.025 inch (.635 mm) thick.
   b. Color: As indicated by architect's designations.

4. Panel Coverage: 12 inches (305 mm).

5. Panel Height: 1.5 inches (38 mm).


2.07 ACCESSORIES
A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Formed from 0.0179-inch- (0.45-mm-) thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.08 FABRICATION

A. General: Fabricate and finish metal wall 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.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
2. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.

B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Where indicated, fabricate metal wall panel joints with factory-installed 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.

2.09 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 and painted 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.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

B. Substrate Board: Install substrate board over wall sheathing on entire wall surface. Attach with substrate-board fasteners.

1. Install substrate board with long joints in continuous straight lines, perpendicular to direction of metal wall panel seams with end joints staggered between rows. Tightly butt substrate boards together.

C. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

D. Install fasciae and copings to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

E. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.03 METAL WALL PANEL INSTALLATION, GENERAL
A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting of metal wall panels by torch is not permitted.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
4. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
5. Install screw fasteners in predrilled holes.
6. Locate and space fastenings in uniform vertical and horizontal alignment.
7. Install flashing and trim as metal wall panel work proceeds.
8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
10. Align bottom of metal 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.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:

1. Steel Wall Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.04 ACCESSORY INSTALLATION
A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.05 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), nonaccumulative, 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.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft. (300 Pa).

C. Water-Spray Test: After completing the installation of 75-foot- (23-m-) by-2-story minimum area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.

D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories. Report results in writing.

E. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.
F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
07 52 16.12.1 SBS MODIFIED BITUMINOUS MEMBRANE ROOFING, TORCH-APPLIED (CONCRETE DECK)

1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing system on concrete deck, including but not limited to:
   a. Roof insulation.
      1). Polysocyanurate roofing insulation (as indicated on plans), with slope in structure or tapered insulation at various locations as required to provide positive drainage with NO PONDING".
      2). Polysocyanurate roofing insulation crickets & saddles (as indicated on plans), 1/2" per foot slope or as required to provide positive drainage with NO PONDING.
      3). One (1) layer of 1/2" thick high performance cement based roof cover board
      4). All insulations are adhered to the concrete deck with specified adhesive per wind uplift requirements.
   b. Roof membrane and membrane base flashings.
      1). One (1) ply of fire rated, high performance, fiberglass reinforced, SBS modified bitumen membrane with ultra-white surfacing, torch-applied.
      2). Two (2) plies of fiberglass reinforced modified base sheet torch applied to insulated substrate.

2. Removal of all abandoned piping, equipment and supports as required and patching or repair of the existing deck, structure and interior as required.

3. All existing roof penetration flashings will be replaced with new roof penetration flashings; including but not limited to lead plumbing vent flashings, heater vents, gravity vents and any other miscellaneous roof penetration flashings.

4. Install proper pipe supports under all pipes and conduit on the roof. Install proper pads under all pipe supports.

B. Related Sections:

1. Division 06 carpentry section for wood nailers, wood cants, curbs, and blocking.
2. Division 07 Section "Preparation for Re-Roofing" for existing roofing tearoff, patching, and substrate preparation for rehabilitation of roofing membrane.
3. Division 07 Section "Sheet Metal Flashing and Trim" for custom metal roof penetration flashings, flashings, and counter flashings.

C. Unit Prices: Refer to Division 01 Section "Unit Prices" for description of Work in this Section affected by unit prices.

1.03 FIRE WATCH

A. Provide fire watch during torch application and continue for two hours after torch work has been completed. All roof areas worked on should be checked for hot spots and signs of smoldering. If available, infrared roof scanners should be used. The inside of the building should also be inspected for signs of fire and smoke.

B. When torch applied materials are installed the Contractor shall provide a fire watch.

C. Provide fire watch during torch application and continue for one hour after torch work has been completed. All roof areas worked on should be checked for hot spots and signs of smoldering. If available, infrared roof scanners should be used. The inside of the building should also be inspected for signs of fire and smoke.

D. Provide at least two 10lb (4.5 kg) multipurpose dry chemical portable extinguisher within 20 ft. (6.1 m) horizontal travel distance of torch-applied roofing equipment.

E. No full-time torch shall be used under any circumstances.

1.04 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.05 ACTION SUBMITTALS

A. All Submittals to be in electronic format.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work. Provide roof plan showing orientation and types of roof deck, orientation of membrane roofing, and fastening spacings and patterns for mechanically fastened components.

1. Crickets, saddles, and tapered edge strips, including slopes.

1.06 INFORMATIONAL SUBMITTALS

A. All submittals to be in electronic format.

B. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.

1. Include letter from Manufacturer written for this Project indicating approval of Installer.

C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements, for wind uplift.

2. Indicate that proposed system components are compatible.
D. Warranties: Unexecuted sample copies of special warranties.

1.07 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.
B. Warranties: Executed copies of warranties.

1.08 SUBSTITUTIONS

A. General:

1. ONLY Substitutions approved in writing by the Owner or Owner’s Representative prior to the scheduled bid date will be considered.

2. Notification of approvals will be issued at least five (5) days before the scheduled bid date.

3. Architect/Owner reserves the right to be final authority on acceptance or rejection of any substitution request.

B. When a particular make or trade name is specified, it shall be indicative of standard required. Bidders proposing substitutes shall submit the following ten (10) days prior to bid date to the Owner or Owner’s Representative; requests received after that time will not be considered.

1. Written application with explanation of why it should be considered.

2. Independent laboratory certification providing written confirmation that the physical and performance characteristics of the substitute material/system will meet the physical and performance characteristics of the specified materials and or system.

C. Submit five copies of request for substitution. Items to be included in the request:

1. Complete data substantiating compliance of proposed substitution.

2. Product identification, including manufacturer’s literature and manufacturer’s name.

3. Current certificate from an accredited testing laboratory comparing the physical and performance attributes of the proposed material with those of the specified materials. Test results must be dated, notarized, and on testing laboratory stationary.

4. Material Safety Data Sheets providing all pertinent data as to flammability, combustibility.

5. List of at least (5) five jobs as described under the requirements where the proposed alternate material was used under similar conditions. These jobs must be available for inspection by the Owner or Owner’s Representative. Names and phone numbers are required for verification. Submit a minimum of 200,000 square feet for review. Submitted projects must be a minimum of (5) years old.

6. Notarized statement from the Roof System Manufacturer, signed by a corporate officer of the corporation stating that:

   a. All Documents have been reviewed and are approved.

   b. The Project site has been inspected.
c. The Roofing System Manufacturer will provide two (2) field inspections weekly; during, and until all construction work is complete and accepted by the owner. A full time employee of the manufacturer must perform inspections.

d. Provide documentation of the proposed alternate system passing the specified regulatory requirements. Documentation must be on the specified regulatory requirements letterhead or approval guide. No third party testing will be accepted.

D. In making substitution request, Bidder/Contractor represents:

1. He has personally investigated proposed product or method and determined that it is equal or superior in all respects to that specified. Additionally, he will have a technical service representative of the proposed manufacturer attend the pre-bid meeting.

2. He will provide the same guarantee for substitution as for those specified.

3. He will coordinate installation of accepted substitution in work, making such changes as may be required for work to be completed in all respects.

4. Advise the owner of any credit savings or additional costs as opposed to the system type specified.

E. Substitutions will not be considered if:

1. Product or method to be considered does not have a minimum of (5) five years of successful performance in roofing and re-roofing of similar applications.

2. Any discrepancies in the test data, or if the tests or submittals are incomplete.

3. They are indicated or implied on Shop Drawings or Project Data Submittals without formal request submitted in accordance with the specification document.

4. Acceptance requires significant revision of documents.

5. Only substitutes approved in writing by prior to scheduled cutoff date will be considered.

6. Notification of approvals will be mailed at least 3 days before bid opening.

7. The Owner will not incur any additional costs for design or construction costs.

1.09 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

1. For torch-applied applications, employ workers certified under NRCA's Certified Roofing Torch Applicator (CERTA) program.

2. Installer must provide (1) manufacturer inspections each week. Noncompliance may result in an $850 per day fee for missing inspections.
B. Manufacturer Qualifications: Approved manufacturer with UL listed roofing systems comparable to those specified for this Project, with minimum five years' experience in manufacture of comparable products in successful use in similar applications, and able to furnish warranty with provisions matching specified requirements.

C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.

D. Random Sampling

1. During course of work, the Architect may secure samples according to ASTM D140-93 of materials being used from containers at job site and submit them to an independent laboratory for comparison to specified material.

2. Should test results prove that material is not equal to specified material:
   a. Contractor shall pay for all testing.
   b. Roofing installed and found not to comply with the specifications shall be removed and replaced with no change in the contract price.

3. Installation quality control
   a. The roofing inspector shall provide written and photographic reports, to be submitted to the architect, owner, roof system installation contractor, appraising the installation of the roof system at each of the project progress stages. The installation contractor shall make all necessary corrections, additions or remedial actions to resolve any issues raised in the reports.
   b. The roofing inspector shall have the authority to have any and all roofing work corrected, as required, to insure the proper installation and weather-tightness of the roof system, in accordance with the manufacturer's specifications.

E. Manufacturer's Installation Instructions: Obtain and maintain on-site access to manufacturer's written instructions for installation of products.

F. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review drawings and specifications.

3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.
6. Review structural loading limitations of roof deck during and after roofing.
7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
8. Review governing regulations and requirements for insurance and certificates if applicable.
9. Review temporary protection requirements for roofing system during and after installation.
10. Review roof observation and repair procedures after roofing installation.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.11 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
   1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed.
   2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
   3. Remove temporary plugs from roof drains at end of each day.
   4. Remove and discard temporary seals before beginning work on adjoining roofing.
1.12 WARRANTY

A. Warranty, General: Warranties specified shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Manufacturer's Warranty: Manufacturer's standard or customized form, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
   1. Manufacturer's warranty includes roofing membrane, base flashings, fasteners, roofing membrane accessories and other components of roofing system specified in this Section.
   2. Warranty Period: 15 years from date of Substantial Completion.

C. Installer's Warranty: Submit roofing Installer’s warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:
   1. Warranty Period: Two years from date of Substantial Completion.

D. Extended Roof System Warranty: Warranties specified in this Section include the following components and systems specified in other sections supplied by the roofing system Manufacturer, and installed by the roofing system Installer:
   1. Sheet metal flashing and trim, including roof penetration flashings.

E. Manufacturer Inspection and Preventive Maintenance Requirement: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner’s warranty rights. The cost of manufacturer's inspections and preventive maintenance is included in the Contract Sum.
   1. Inspections to occur in the following years subsequent to completion: 2, 5 and 10.

2.00 PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer. Obtain components for roofing system compatible with specified approved assembly.

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Roofing shall withstand exposure to weather without failure or leaks due to defective manufacture or installation.
   1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Wind uplift Compliance: Provide roofing membrane, base flashing, and component materials that comply with the requirements to acquire a certificate of wind storm from the State of Texas. Basis of Compliance: NEMO Evaluation Report 11425.04.16-2-R10 for FL20325-R10 Construction C-30. IT IS THE BIDDERS RESPONSIBILITY TO READ AND UNDERSTAND THE TESTED ASSEMBLY. IF NEEDED A COPY OF THE TESTED CONSTRUCTION ASSEMBLY LISTED ABOVE CAN BE OBTAINED FROM THE SYSTEM MANUFACTURER.

D. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency in accordance with ANSI/FM 4474, UL 580, or UL 1897, and to resist uplift pressures.

1. All Zones (Corner, Perimeter, and Field-of-Roof) Uplift Pressures: As indicated on Drawings. Verify system is acceptable and complies with uplift requirements with project engineer prior to installation.

E. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings. Verify sheet metal installation complies with windstorm requirements of project engineer prior to installation.

F. Flashings and Fastening: Comply with requirements of Division 07 Sections "Sheet Metal Flashing and Trim". Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:

1. FM Global 1-49: Loss Prevention Data Sheet for Perimeter Flashings.
2. FM Global 1-29: Loss Prevention Data Sheet for Above Deck Roof Components.
3. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.

G. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

H. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

2.03 ROOFING MEMBRANE MATERIALS

A. Base Ply Sheet:

1. ASTM D 6163 Type I Grade S SBS/SIS/SEBS-modified asphalt-coated glass-fiber reinforced sheet, smooth surfaced, designed for heat-welded applications.
b. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 70 lbf/in (12.3 kN/m) machine direction; 50 lbf/in (8.8 kN/m) cross-machine direction.

c. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 100 lbf (445 N) machine direction; 80 lbf (400 N) machine direction.


f. Thickness, ASTM D 5147: 0.118 inch (3.0 mm).

B. SBS Modified Bituminous Membrane Ply Sheets:

1. ASTM D 6163 Type I Grade S SBS/SIS/SEBS-modified asphalt-coated glass-fiber reinforced sheet, smooth surfaced, designed for heat-welded applications.


b. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 70 lbf/in (12.3 kN/m) machine direction; 50 lbf/in (8.8 kN/m) cross-machine direction.

c. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 100 lbf (445 N) machine direction; 80 lbf (400 N) machine direction.


f. Thickness, ASTM D 5147: 0.118 inch (3.0 mm).

C. SBS Modified Bituminous Cap Sheet:

1. ASTM D 6163 Type I Grade G SBS-modified asphalt-coated glass-fiber-reinforced sheet, designed for heat welded application, granular surfaced with a factory applied white reflective granule; CRRC listed and California Title 24 Energy Code compliant.


b. Exterior Fire-Test Exposure, ASTM E 108: Class A.

c. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 70 lbf/in (12.0 kN/m); Cross machine direction 50 lbf/in (8.8 kN/m).

d. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction, 100 lbf (445 N); Cross machine direction 90 lbf (400 N).

e. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 4 percent; Cross machine direction 4 percent.


g. Thickness, minimum, ASTM D 5147: 0.165 inch (4.2 mm).


D. Base Flashing Backer Sheet:

1. ASTM D 6162 Type III Grade S SBS/SIS/SEBS-modified asphalt-coated composite polyester and glass-fiber reinforced sheet, smooth surfaced, designed for heat-welded applications.

b. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 275 lbf/in (48 kN/m).


d. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 3 percent.


f. Thickness, ASTM D 5147: 0.090 inch (2.3 mm).

2. ASTM D 6162 Type III Grade S SBS/SIS/SEBS-modified asphalt-coated composite polyester and glass-fiber reinforced sheet, smooth surfaced, designed for heat-welded applications.


b. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 275 lbf/in (48 kN/m).


d. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 3 percent.


f. Thickness, ASTM D 5147: 0.090 inch (2.3 mm).

E. Base Flashing Sheet:

1. ASTM D 6163 Type I Grade G SBS-modified asphalt-coated glass-fiber-reinforced sheet, designed for heat welded application, granular surfaced with a factory applied white reflective granule; CRRC listed and California Title 24 Energy Code compliant.


b. Exterior Fire-Test Exposure, ASTM E 108: Class A.

c. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 70 lbf/in (12.0 kN/m); Cross machine direction 50 lbf/in (8.8 kN/m).

d. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction, 100 lbf (445 N); Cross machine direction 90 lbf (400 N).

e. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 4 percent; Cross machine direction 4 percent.


g. Thickness, minimum, ASTM D 5147: 0.165 inch (4.2 mm).


2.04 ASPHALT MATERIALS

A. Asphalt primer, water-based, polymer modified.

1. Basis of design product: Tremco, TREMprime WB.

2. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 2 g/L.
B. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.

2.05 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

C. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.
   1. Elastomeric Roofing Mastic, Low-Volatile: One-part, trowel-grade, elastomeric roof mastic specially formulated for compatibility and use with specified roofing membranes and flashings.
      a. Basis of design product: Tremco, POLYroof LV.
      b. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 300 g/L.
      d. Recovery from 500 percent Elongation, minimum, ASTM D 412: 500 percent.
      e. Flexibility at -40 deg. F (-40 deg. C), ASTM D 3111: No cracking.

2. Asphalt mastic for miscellaneous sealing and waterproofing:
   a. An asphalt-based, heavily fibrated, asbestos free mastic.
   b. Basis of Design: Tremco ELS.

3. Pitch pan mastic:
   a. High performance single component roof elastomer.
   b. Basis of Design: Tremco POLYroof LV
   c. CHEM CURBS ARE NOT ACCEPTABLE

4. Metal Joint Sealant:
   a. Asbestos-free. Moisture cured, one-component polyurethane sealant.
   b. Basis of Design: TremSEAL Pro

5. Reglet Joint Sealant
   a. One-part, bituminous polyurethane sealant.

6. Vents and/or Stacks:
   a. Stainless: Type 316, No 3 Polish.
   b. Gage: Twenty-four (24).
c. Solder: ASTM B32-89, alloy grade 60A. Neutralize flux after soldering.

7. Termination Bar for top edge of all base flashings:
   a. Extruded aluminum, pre-punched 8” o.c.

8. Primary Scuppers and Overflow Scuppers:
   a. Stainless Steel, Type 316, No 3 Polish Finish (all locations except those designated as copper): Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527.

9. Fascia, Coping, Collector Heads, Gutters, Downspouts and other Visible Sheet Metal Flashing:
   a. Stainless Steel, Type 316, No 3 Polish Finish (all locations except those designated as copper): Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527.

10. Counter flashing, slip flashing:
    a. Stainless Steel, Type 316, No 3 Polish Finish (all locations except those designated as copper): Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527.

11. Pitch pans with hoods:
    a. Stainless Steel, Type 316, No 3 Polish: Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527.

12. Walkway Pads for all access panels at all A/C units:
    a. Mineral-surfaced asphaltic composition panels, factory formed, nonporous, with a slip-resisting surface texture, manufactured specifically for adhering to built-up roofing as a protection course for foot traffic:
       1). Thickness: 1/2 inch
    b. Basis of Design: Tremco TremTred.

13. Pipe Supports:
    a. Pipe supports for small pipes and conduit:
       1). Pipe or Conduit size: 1/4” to 1.5” ID
       2). Rubber triangle pipe blocks extruded from 100% EPDM rubber.
    b. Basis of Design: Rubber Triangle Pipe Blocks by Tremco or pre-approved substitution.

14. Pipe Supports for large pipes and conduit:
    a. Pipe or Conduit size: 1.5” or larger ID
    b. Galvanized roller pipe supports.
    c. Basis of Design: SS8-R or RB-18 as applicable by PHP Pipe supports of Houston, TX or approved equal.
15. Primer:
   a. An asbestos free, modified water-based asphalt primer
   b. Basis of Design: Tremco Tremprime WB.

16. Flashing tape for top edge of base flashing
   a. A flexible, non-drying, butyl-based, gasket-forming sealant tape.
   b. Basis of design: Tremco TF Tape

17. Reinforcement membrane:
   a. A non-shrinking, non-rotting, vinyl coated, woven glass mesh.
   b. Basis of Design: Tremco Burmesh - 6”.

2.06 INSULATION ADHESIVES

A. Two-Part Urethane Insulation Adhesive (UIA) is a two-component polyurethane adhesive used for attaching insulation boards to the roof deck or to other insulation boards

1. Basis of design product: Tremco LRF
   a. Tremco: LRF
      1). Tremco LRF
      2). Royal: Millennium PG-1

2.07 ROOF INSULATION

A. Roof Insulation, General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.

1. Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

B. Roof Insulation:

1. Polysisocyanurate board insulation, ASTM C 1289 Type II Class 2 CFC- and HCFC- free, with recycled content glass-fiber mat facer on both major surfaces.
   c. Available Manufacturers
      1). Tremco:Trisotech
      2). Atlas: AC Foam II, AC Foam III

C. Roof Insulation Cover board

1. Cement based, water durable, mold resistant, noncombustible, Class A unlimited slope, ASTM E84
2. Basis of Design: USG Cement Roof Board

D. Wood Cant Strips: Comply with requirements in Division 06 carpentry section

E. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

2.08 WALKWAYS

A. Walkway pads, ceramic-granule-surfaced reinforced asphaltic composition slip-resisting pads, manufactured as a traffic pad for foot traffic, 1/2 inch (13 mm) thick minimum.
   2. Flexural Strength at max. load, minimum, ASTM C 203: 210 psi (1.5 kPa).
   5. Pad Size: 36 by 48 inch (914 by 1220 mm).

2.09 WALL TREATMENT AND COATING MATERIALS

A. Primer for previously coated walls above roof membrane:
   1. Acrylic polymer emulsion, stain resistant, fast drying, flexible base primer for elastomeric latex coatings.

B. Coating for previously coated walls above roof membrane:
   1. Acrylic polymer emulsion wall coating with fiber reinforcement.
   2. Tinted to match existing.
   3. Basis of Design: Tremco Solargard HY-BUILD

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
   1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
   2. Verify that, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation. wood cant
   3. Concrete Roof Deck:
      a. Verify that minimum concrete drying period recommended by roofing manufacturer has passed.
      b. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
c. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

4. Verify that existing insulation and substrate is sound and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer’s written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.03 INSTALLATION, GENERAL

A. Install roofing system in accordance with manufacturer's recommendations.

B. Install wood cants, blocking, curbs, and nailers in accordance with requirements of Division 06 carpentry section and as necessary to meet ANSI SPRI ES-1 requirements.

C. Install roofing system in accordance with the following NRCA Manual Plates and NRCA recommendations; modify as required to comply with requirements of FM Global references above:

1. Metal Parapet Cap (Coping) and Base Flashing: Plates MB-1 and MB-1S.

2. Surface-Mounted Counterflashing for Concrete Walls (at Parapet Wall): Plates MB-4 and MB-4S.

3. Base Flashing for Wall-supported Deck: Plates MB-5 and MB-5S.

4. Base Flashing for Non-wall-supported deck (Movement Joint): Plates MB-6 and MB-6S.

5. Base and Surface-mounted Counterflashing: Plates MB-4 and MB-4S.

6. Base Flashing for Vented Base Sheet: Plates MB-5A and MB-5AS.

7. Raised Perimeter Edge with Metal Flashing (Fascia Cap): Plates MB-2 and MB-2S.

8. Embedded Edge Metal Flashing Edge (Gravel-stop): Plates MB-3 and MB-3S.


10. Gutter at Draining Edge: Plates MB-22 and MB-22S.

11. Expansion Joint with Metal Cover: Plates MB-7 and MB-7S and Division 07 Section "Sheet Metal Flashing and Trim."

12. Expansion Joint with Premanufactured Cover: Plates MB-7A and MB-7AS.

13. Area Divider in Roof System: Plates MB-8 and MB-8S.

14. Equipment Support Curb: Plates MB-9 and MB-9S.

17. Raised Curb Detail at Rooftop HVAC Units, Premanufactured: Plates MB-12 and MB-12S.
18. Raised Curb Detail at Rooftop HVAC Units (Job site constructed wood curb): Plates MB-13 and MB-13S and Division 06 Section "Miscellaneous Rough Carpentry."
19. Skylight, Scuttle (Roof Hatch), and Smoke Vents: Plates MB-14 and MB-14S.
20. Penetration, Structural Member through Roof Deck: Plates MB-15 and MB-15S.
21. Penetration, Sheet Metal Enclosure for Piping Through Roof Deck: Plates MB-16 and MB-16S
22. Penetration, Isolated Stack Flashing: Plates MB-17 and MB-17S.
23. Penetration, Isolated Stack Flashing: Plates MB-17A and MB-17AS.
24. Penetration, Plumbing Vent: Plates MB-18 and MB-18S.
25. Penetration, Pocket: Plates MB-19 and MB-19S.
26. Roof Drain: Plates MB-20 and MB-20S.
27. Roof Drain: Plates MB-20A and MB-20AS.
28. Guide for Clearances between Pipes / Walls / Curbs - Table 4
29. Guide for Crickets and Saddles - Table 5
30. Guide for Edge Scuppers with Tapered Saddles - Table 6

3.04 INSULATION INSTALLATION

A. Comply with built-up roofing manufacturer's written instructions for installing roof insulation.
B. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.
C. Install tapered insulation under area of roofing to conform to slopes indicated.
D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
   1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inch (70 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
   1. Install insulation at minimum thickness of 2.5 inches (64 mm).
F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

H. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
   1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
   2. Install adhered insulation using minimum of 3/4” wide bead of adhesive at 12” on center minimum spacing. Special care to be given to perimeter edge to avoid soft spots in insulation.

I. Cover Board Installation: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.
   1. Set cover boards in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
   2. Install adhered insulation using minimum of 3/4” wide bead of adhesive at 12” on center minimum spacing. Special care to be given to perimeter edge to avoid soft spots in insulation.

3.05 TORCH-APPLIED ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA’s "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
   1. Deck Type: Concrete deck.
   2. Base Sheet: One.
   3. Inner Membrane Sheet: One.
   4. Granular-Surfaced SBS-Modified Asphalt Cap Sheet:

B. Start installation of roofing membrane in presence of roofing system manufacturer’s technical personnel.

C. Cooperate with testing agencies engaged or required to perform services for installing roofing system.

D. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
   1. Provide tie-offs at end of each day’s work configured as recommended by NRCA Roofing Manual Appendix: Quality Control Guidelines - Insulation to protect new and existing roofing.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.

3. Remove temporary plugs from roof drains at end of each day.

4. Remove and discard temporary seals before beginning work on adjoining roofing.

3.06 BASE-PLY SHEET INSTALLATION

A. Loosely lay one course of, lapping edges and ends a minimum of 2 inches and 6 inches (50 mm and 150 mm), respectively.

B. Install lapped base-sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
   1. Torch-apply to substrate.

3.07 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install modified bituminous roofing membrane sheet and cap sheet according to roofing manufacturer’s written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
   1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
   2. Torch apply to substrate in accordance with manufacturer’s written instructions and NRCA CERTA guidelines.

B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Install roofing membrane sheets so side and end laps shed water. Completely bond and seal laps, leaving no voids.
   1. Repair tears and voids in laps and lapped seams not completely sealed.
   2. Apply roofing granules to cover exuded bead at laps while bead is hot.

3.08 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer’s written instructions, and as follows:
   1. Extend base flashing up walls or parapets a minimum of 12 inches (300 mm) above built-up roofing and 6 inches (150 mm) onto field of roof membrane.
   2. Prime substrates with asphalt primer if required by roofing system manufacturer.
   4. Flashing Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer. Seal joints in flashing sheet. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
5. Flashing Sheet Application: Torch-apply flashing sheet to substrate.

B. Seal top termination of base flashing with a metal termination bar.
C. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.
D. Roof Drains: Set 30 by 30 inch (760 by 760 mm) square metal flashing in bed of asphalt roofing cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
   1. Install stripping according to roofing system manufacturer's written instructions.

3.09 WALKWAY INSTALLATION

A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.
   1. Sweep away loose aggregate surfacing.
   2. Set walkway pads in cold-applied adhesive.

3.10 WALL TREATMENT AND COATING INSTALLATION

A. Wall coating at previously coated walls above the roof membrane:
   1. Pressure wash and clean masonry wall to be coated.
   2. Provide repairs to cracks in masonry wall larger than 1/8" with urethane caulk.
   3. Masonry walls are to be primed with specified primer. Refer to product data for coverage rates.
   4. Apply three (3) coats of the specified elastomeric wall coating as recommended by the manufacturer in owner selected color.

3.11 FIELD QUALITY CONTROL

A. Roofing Inspector: Owner will engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.
B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation at commencement and upon completion.
   1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
C. Repair or remove and replace components of built-up roofing where test results or inspections indicate that they do not comply with specified requirements.
   1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.
3.12 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION
07 52 16.12.2 SBS MODIFIED BITUMINOUS MEMBRANE ROOFING, TORCH-APPLIED (STEEL DECK)

1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing system on concrete deck, including but not limited to:

   a. Roof insulation.

      1). Polysocyanurate roofing insulation (as indicated on plans), with slope in structure or tapered insulation at various locations as required to provide positive drainage with NO PONDING".

      2). Polysocyanurate roofing insulation crickets & saddles (as indicated on plans), 1/2" per foot slope or as required to provide positive drainage with NO PONDING.

      3). One (1) layer of 1/2" thick high performance cement based roof cover board

      4). Mechanically fastened insulation to the metal deck per FM 1-29 pre-securement requirements.

      5). Mechanically fastened base sheet to the metal deck along with specified striping in adhesive.

   b. Roof membrane and membrane base flashings.

      1). One (1) ply of fire rated, high performance, fiberglass reinforced, SBS modified bitumen membrane with ultra-white surfacing, torch-applied.

      2). Two (2) plies of fiberglass reinforced modified base sheet torch applied to mechanically fastened base sheet.

B. Related Sections:

1. Division 06 carpentry section for wood nailers, wood cants, curbs, and blocking.

2. Division 07 Section "Preparation for Re-Roofing" for existing roofing tearoff, patching, and substrate preparation for rehabilitation of roofing membrane.

3. Division 07 Section "Sheet Metal Flashing and Trim" for custom metal roof penetration flashings, flashings, and counter flashings.

C. Unit Prices: Refer to Division 01 Section "Unit Prices" for description of Work in this Section affected by unit prices.
1.03 FIRE WATCH

A. Provide fire watch during torch application and continue for two hours after torch work has been completed. All roof areas worked on should be checked for hot spots and signs of smoldering. If available, infrared roof scanners should be used. The inside of the building should also be inspected for signs of fire and smoke.

B. When torch applied materials are installed the Contractor shall provide a fire watch.

C. Provide fire watch during torch application and continue for one hour after torch work has been completed. All roof areas worked on should be checked for hot spots and signs of smoldering. If available, infrared roof scanners should be used. The inside of the building should also be inspected for signs of fire and smoke.

D. Provide at least two 10lb (4.5 kg) multipurpose dry chemical portable extinguisher within 20 ft. (6.1 m) horizontal travel distance of torch-applied roofing equipment.

E. No full-time torch shall be used under any circumstances.

1.04 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.05 ACTION SUBMITTALS

A. All Submittals to be in electronic format.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work. Provide roof plan showing orientation and types of roof deck, orientation of membrane roofing, and fastening spacings and patterns for mechanically fastened components.
   1. Crickets, saddles, and tapered edge strips, including slopes.

1.06 INFORMATIONAL SUBMITTALS

A. Contractor's Product Certificate: Submit notarized certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

B. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.
   1. Include letter from Manufacturer written for this Project indicating approval of Installer.

C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of compliance with performance requirements, including FM Global system approval.
   2. Indicate that proposed system components are compatible.

D. Warranties: Unexecuted sample copies of special warranties.
1.07 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

B. Warranties: Executed copies of warranties.

1.08 SUBSTITUTIONS

A. General:

1. ONLY Substitutions approved in writing by the Owner or Owner’s Representative prior to the scheduled bid date will be considered.

2. Notification of approvals will be issued at least five (5) days before the scheduled bid date.

3. Architect/Owner reserves the right to be final authority on acceptance or rejection of any substitution request.

B. When a particular make or trade name is specified, it shall be indicative of standard required. Bidders proposing substitutes shall submit the following ten (10) days prior to bid date to the Owner or Owner’s Representative; requests received after that time will not be considered.

1. Written application with explanation of why it should be considered.

2. Independent laboratory certification providing written confirmation that the physical and performance characteristics of the substitute material/system will meet the physical and performance characteristics of the specified materials and or system.

C. Submit five copies of request for substitution. Items to be included in the request:

1. Complete data substantiating compliance of proposed substitution.

2. Product identification, including manufacturer’s literature and manufacturer’s name.

3. Current certificate from an accredited testing laboratory comparing the physical and performance attributes of the proposed material with those of the specified materials. Test results must be dated, notarized, and on testing laboratory stationary.

4. Material Safety Data Sheets providing all pertinent data as to flammability, combustibility.

5. List of at least (5) five jobs as described under the requirements where the proposed alternate material was used under similar conditions. These jobs must be available for inspection by the Owner or Owner’s Representative. Names and phone numbers are required for verification. Submit a minimum of 200,000 square feet for review. Submitted projects must be a minimum of (5) years old.

6. Notarized statement from the Roof System Manufacturer, signed by a corporate officer of the corporation stating that:

   a. All Documents have been reviewed and are approved.

   b. The Project site has been inspected.
c. The Roofing System Manufacturer will provide two (2) field inspections weekly; during, and until all construction work is complete and accepted by the owner. A full time employee of the manufacturer must perform inspections.

d. Provide documentation of the proposed alternate system passing the specified regulatory requirements. Documentation must be on the specified regulatory requirements letterhead or approval guide. No third party testing will be accepted.

D. In making substitution request, Bidder/Contractor represents:
   1. He has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified. Additionally, he will have a technical service representative of the proposed manufacturer attend the pre-bid meeting.
   2. He will provide the same guarantee for substitution as for those specified.
   3. He will coordinate installation of accepted substitution in work, making such changes as may be required for work to be completed in all respects.
   4. Advise the owner of any credit savings or additional costs as opposed to the system type specified.

E. Substitutions will not be considered if:
   1. Product or method to be considered does not have a minimum of (5) five years of successful performance in roofing and re-roofing of similar applications.
   2. Any discrepancies in the test data, or if the tests or submittals are incomplete.
   3. They are indicated or implied on Shop Drawings or Project Data Submittals without formal request submitted in accordance with the specification document.
   4. Acceptance requires significant revision of documents.
   5. Only substitutes approved in writing by prior to scheduled cutoff date will be considered.
   6. Notification of approvals will be mailed at least 3 days before bid opening.
   7. The Owner will not incur any additional costs for design or construction costs.

1.09 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.
   1. For torch-applied applications, employ workers certified under NRCA's Certified Roofing Torch Applicator (CERTA) program.
   2. Installer must provide (1) manufacturer inspections each week. Noncompliance may result in an $850 per day fee for missing inspections.
B. Manufacturer Qualifications: Approved manufacturer with UL listed roofing systems comparable to those specified for this Project, with minimum five years' experience in manufacture of comparable products in successful use in similar applications, and able to furnish warranty with provisions matching specified requirements.

C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.

D. Random Sampling

1. During course of work, the Architect may secure samples according to ASTM D140-93 of materials being used from containers at job site and submit them to an independent laboratory for comparison to specified material.

2. Should test results prove that material is not equal to specified material:
   a. Contractor shall pay for all testing.
   b. Roofing installed and found not to comply with the specifications shall be removed and replaced with no change in the contract price.

3. Installation quality control
   a. The roofing inspector shall provide written and photographic reports, to be submitted to the architect, owner, roof system installation contractor, appraising the installation of the roof system at each of the project progress stages. The installation contractor shall make all necessary corrections, additions or remedial actions to resolve any issues raised in the reports.
   b. The roofing inspector shall have the authority to have any and all roofing work corrected, as required, to insure the proper installation and weather-tightness of the roof system, in accordance with the manufacturer's specifications.

E. Manufacturer's Installation Instructions: Obtain and maintain on-site access to manufacturer's written instructions for installation of products.

F. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review drawings and specifications.

3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.

6. Review structural loading limitations of roof deck during and after roofing.

7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

8. Review governing regulations and requirements for insurance and certificates if applicable.

9. Review temporary protection requirements for roofing system during and after installation.

10. Review roof observation and repair procedures after roofing installation.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.11 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed.

2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.

3. Remove temporary plugs from roof drains at end of each day.

4. Remove and discard temporary seals before beginning work on adjoining roofing.
1.12 WARRANTY

A. Warranty, General: Warranties specified shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Manufacturer's Warranty: Manufacturer's standard or customized form, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
   1. Manufacturer's warranty includes roofing membrane, base flashings, fasteners, roofing membrane accessories and other components of roofing system specified in this Section.
   2. Warranty Period: 15 years from date of Substantial Completion.

C. Installer's Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:
   1. Warranty Period: Two years from date of Substantial Completion.

D. Extended Roof System Warranty: Warranties specified in this Section include the following components and systems specified in other sections supplied by the roofing system Manufacturer, and installed by the roofing system Installer:
   1. Sheet metal flashing and trim, including roof penetration flashings.

E. Manufacturer Inspection and Preventive Maintenance Requirement: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections and preventive maintenance is included in the Contract Sum.
   1. Inspections to occur in the following years subsequent to completion: 2, 5 and 10.

2.00 PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer. Obtain components for roofing system compatible with specified approved assembly.

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Roofing shall withstand exposure to weather without failure or leaks due to defective manufacture or installation.
   1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Wind uplift Compliance: Provide roofing membrane, base flashing, and component materials that comply with the requirements to acquire a certificate of wind storm from the State of Texas. Basis of Compliance: NEMO Evaluation Report 11425.04.16-2-R10 for FL20325-R10 Construction S-227 IT IS THE BIDDERS RESPONSIBILITY TO READ AND UNDERSTAND THE TESTED ASSEMBLY. IF NEEDED A COPY OF THE TESTED CONSTRUCTION ASSEMBLY LISTED ABOVE CAN BE OBTAINED FROM THE SYSTEM MANUFACTURER.

D. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency in accordance with ANSI/FM 4474, UL 580, or UL 1897, and to resist uplift pressures.

   1. All Zones (Corner, Perimeter, and Field-of-Roof) Uplift Pressures: As indicated on Drawings. Verify system is acceptable and complies with uplift requirements with project engineer prior to installation.

E. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:

   1. Design Pressure: As indicated on Drawings. Verify sheet metal installation complies with windstorm requirements of project engineer prior to installation.

F. Flashings and Fastening: Comply with requirements of Division 07 Sections "Sheet Metal Flashing and Trim" and "Roof Specialties." Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:

   1. FM Global 1-49: Loss Prevention Data Sheet for Perimeter Flashings.
   2. FM Global 1-29: Loss Prevention Data Sheet for Above Deck Roof Components.
   3. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.

G. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

H. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

2.03 ROOFING MEMBRANE MATERIALS

A. Base Sheet:

   1. ASTM D 6163 Type I Grade S SBS/SIS/SEBS-modified asphalt-coated glass-fiber reinforced sheet, smooth surfaced, designed for heat-welded applications.
      
b. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 70 lbf/in (12.3 kN/m) machine direction; 50 lbf/in (8.8 kN/m) cross-machine direction.

c. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 100 lbf (445 N) machine direction; 80 lbf (400 N) machine direction.


f. Thickness, ASTM D 5147: 0.118 inch (3.0 mm).

B. SBS Modified Bituminous Membrane Ply Sheets:

1. ASTM D 6163 Type I Grade S SBS/SIS/SEBS-modified asphalt-coated glass-fiber reinforced sheet, smooth surfaced, designed for heat-welded applications.


   b. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 70 lbf/in (12.3 kN/m) machine direction; 50 lbf/in (8.8 kN/m) cross-machine direction.

   c. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 100 lbf (445 N) machine direction; 80 lbf (400 N) machine direction.


   f. Thickness, ASTM D 5147: 0.118 inch (3.0 mm).

C. SBS Modified Bituminous Cap Sheet:

1. ASTM D 6163 Type I Grade G SBS-modified asphalt-coated glass-fiber-reinforced sheet, designed for heat welded application, granular surfaced with a factory applied white reflective granule; CRRC listed and California Title 24 Energy Code compliant.


   b. Exterior Fire-Test Exposure, ASTM E 108: Class A.

   c. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 70 lbf/in (12.0 kN/m); Cross machine direction 50 lbf/in (8.8 kN/m).

   d. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction, 100 lbf (445 N); Cross machine direction 90 lbf (400 N).

   e. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 4 percent; Cross machine direction 4 percent.


   g. Thickness, minimum, ASTM D 5147: 0.165 inch (4.2 mm).


D. Base Flashing Backer Sheet:

1. ASTM D 6162 Type III Grade S SBS/SIS/SEBS-modified asphalt-coated composite polyester and glass-fiber reinforced sheet, smooth surfaced, designed for heat-welded applications.
b. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 275 lbf/in (48 kN/m).
d. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 3 percent.
f. Thickness, ASTM D 5147: 0.090 inch (2.3 mm).

2. ASTM D 6162 Type III Grade S SBS/SIS/SEBS-modified asphalt-coated composite polyester and glass-fiber reinforced sheet, smooth surfaced, designed for heat-welded applications.
   b. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 275 lbf/in (48 kN/m).
   d. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: 3 percent.
   f. Thickness, ASTM D 5147: 0.090 inch (2.3 mm).

E. Base Flashing Sheet:

1. ASTM D 6163 Type I Grade G SBS-modified asphalt-coated glass-fiber-reinforced sheet, designed for heat welded application, granular surfaced with a factory applied white reflective granule; CRRC listed and California Title 24 Energy Code compliant.
   b. Exterior Fire-Test Exposure, ASTM E 108: Class A.
   c. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 70 lbf/in (12.0 kN/m); Cross machine direction 50 lbf/in (8.8 kN/m).
   d. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction, 100 lbf (445 N); Cross machine direction 90 lbf (400 N).
   e. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 4 percent; Cross machine direction 4 percent.
   g. Thickness, minimum, ASTM D 5147: 0.165 inch (4.2 mm).

2.04 ASPHALT MATERIALS

A. Asphalt primer, water-based, polymer modified.
   1. Basis of design product: Tremco, TREMprime WB.
   2. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 2 g/L.
B. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.

2.05 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

C. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.
   1. Elastomeric Roofing Mastic, Low-Volatile: One-part, trowel-grade, elastomeric roof mastic specially formulated for compatibility and use with specified roofing membranes and flashings.
      a. Basis of design product: Tremco, POLYroof LV.
      b. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 300 g/L.
      d. Recovery from 500 percent Elongation, minimum, ASTM D 412: 500 percent.
      e. Flexibility at -40 deg. F (-40 deg. C), ASTM D 3111: No cracking.
   2. Asphalt mastic for miscellaneous sealing and waterproofing:
      a. An asphalt-based, heavily fibrated, asbestos free mastic.
      b. Basis of Design: Tremco ELS.
   3. Pitch pan mastic:
      a. High performance single component roof elastomer.
      b. Basis of Design: Tremco POLYroof LV
      c. CHEM CURBS ARE NOT ACCEPTABLE
   4. Metal Joint Sealant:
      a. Asbestos-free. Moisture cured, one-component polyurethane sealant.
      b. Basis of Design: TremSEAL Pro
   5. Reglet Joint Sealant
      a. One-part, bituminous polyurethane sealant.
   6. Vents and/or Stacks:
      a. Stainless: Type 316, No 3 Polish.
      b. Gage: Twenty-four (24).
c. Solder: ASTM B32-89, alloy grade 60A. Neutralize flux after soldering.

7. Termination Bar for top edge of all base flashings:
   a. Extruded aluminum, pre-punched 8” o.c.

8. Primary Scuppers and Overflow Scuppers:
   a. Stainless Steel, Type 316, No 3 Polish Finish (all locations except those designated as copper): Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527.

9. Fascia, Coping, Collector Heads, Gutters, Downspouts and other Visible Sheet Metal Flashing:
   a. Stainless Steel, Type 316, No 3 Polish Finish (all locations except those designated as copper): Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527

10. Counter flashing, slip flashing:
    a. Stainless Steel, Type 316, No 3 Polish Finish (all locations except those designated as copper): Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527

11. Pitch pans with hoods:
    a. Stainless Steel, Type 316 No 3 Polish: Twenty-four (24) gauge minimum, stainless steel; commercial quality, Fed. Spec. QQ-S-775, Type I, Class D or ASTM A 526 or lock forming quality ASTM A 527, G90 coating in accordance with ASTM A 525

12. Walkway Pads for all access panels at all A/C units:
    a. Mineral-surfaced asphaltic composition panels, factory formed, nonporous, with a slip-resisting surface texture, manufactured specifically for adhering to built-up roofing as a protection course for foot traffic:
       1). Thickness: 1/2 inch
    b. Basis of Design: Tremco TremTred.

13. Pipe Supports:
    a. Pipe supports for small pipes and conduit:
       1). Pipe or Conduit size: 1/4” to 1.5” ID
       2). Rubber triangle pipe blocks extruded from 100% EPDM rubber.
    b. Basis of Design: Rubber Triangle Pipe Blocks by Tremco or pre-approved substitution.

14. Pipe Supports for large pipes and conduit:
    a. Pipe or Conduit size: 1.5” or larger ID
    b. Galvanized roller pipe supports.
    c. Basis of Design: SS8-R or RB-18 as applicable by PHP Pipe supports of Houston, TX or approved equal.
15. Primer:
   a. An asbestos free, modified water-based asphalt primer
   b. Basis of Design: Tremco Tremprime WB.

16. Flashing tape for top edge of base flashing
   a. A flexible, non-drying, butyl-based, gasket-forming sealant tape.
   b. Basis of design: Tremco TF Tape

17. Reinforcement membrane:
   a. A non-shrinking, non-rotting, vinyl coated, woven glass mesh.
   b. Basis of Design: Tremco Burmesh - 6”.

2.06 BASE SHEET LAP & CENTER FASTENER ROW STRIPING ADHESIVE

A. Two-Part Urethane Insulation Adhesive (UIA) is a two-component polyurethane adhesive used for attaching insulation boards to the roof deck or to other insulation boards
   1. Basis of design product: Tremco LRF
      a. Tremco: LRF
      1). Tremco LRF

2.07 ROOF INSULATION

A. Roof Insulation, General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.
   1. Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.
   2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

B. Roof Insulation:
   1. Polyisocyanurate board insulation, ASTM C 1289 Type II Class 2 CFC- and HCFC- free, with recycled content glass-fiber mat facer on both major surfaces.
      c. Available Manufacturers
         1). Tremco:Trisotech
         2). Atlas: AC Foam II, AC Foam III

C. Roof Insulation Cover board
   1. Cement based, water durable, mold resistant, non combustible, Class A unlimited slope, ASTM E84
   2. Basis of Design: USG Cement Roof Board
D. Wood Cant Strips: Comply with requirements in Division 06 carpentry section
E. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
F. Substrate Joint Tape: Minimum 6 inch (150 mm) wide, coated, glass-fiber joint tape.

2.08 MECHANICAL FASTENERS

A. Fasteners Engineered to secure insulation, cover boards, base sheets and single ply roofing
membrane systems to corrugated steel substrate
   1. Tremco; #15 EHD with Tremco 2.4 inch barbed Seam Plates
   2. Trufast; #15 EHD with Trufast 2.4 inch barbed Seam Plates

2.09 WALKWAYS

A. Walkway pads, ceramic-granule-surfaced reinforced asphaltic composition slip-resisting
pads, manufactured as a traffic pad for foot traffic, 1/2 inch (13 mm) thick minimum.
   2. Flexural Strength at max. load, minimum, ASTM C 203: 210 psi (1.5 kPa).
   5. Pad Size: 36 by 48 inch (914 by 1220 mm).

2.10 WALL TREATMENT AND COATING MATERIALS

A. Primer for previously coated walls above roof membrane:
   1. Acrylic polymer emulsion, stain resistant, fast drying, flexible base primer for
      elastomeric latex coatings.
B. Coating for previously coated walls above roof membrane:
   1. Acrylic polymer emulsion wall coating with fiber reinforcement.
   2. Tinted to match existing.
   3. Basis of Design: Tremco Solargard HY-BUILD

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the
following requirements and other conditions affecting performance of roofing system:
   1. Verify that roof openings and penetrations are in place and curbs are set and braced and
      that roof drain bodies are securely clamped in place.
2. Verify that, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation. Wood cants.

3. Steel Roof Deck:
   a. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
   b. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.

4. Verify that existing insulation and substrate is sound and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.03 INSTALLATION, GENERAL

A. Install roofing system in accordance with manufacturer's recommendations.

B. Install wood cants, blocking, curbs, and nailers in accordance with requirements of Division 06 carpentry section and as necessary to meet ANSI SPRI ES-1 requirements.

C. Install roofing membrane, base flashings, and component materials in compliance with requirements in FM Global 4470 as part of a membrane roofing system as listed in FM Global's "Approval Guide" for fire/windstorm classification indicated. Comply with recommendations in FM Global Loss Prevention Data Sheet 1-49, including requirements for wood nailers and cants.

D. Install roofing system in accordance with the following NRCA Manual Plates and NRCA recommendations; modify as required to comply with requirements of FM Global references above:
   1. Metal Parapet Cap (Coping) and Base Flashing: Plates MB-1 and MB-1S.
   2. Surface-Mounted Counterflashing for Concrete Walls (at Parapet Wall): Plates MB-4 and MB-4S.
   3. Base Flashing for Wall-supported Deck: Plates MB-5 and MB-5S.
   4. Base Flashing for Non-wall-supported deck (Movement Joint): Plates MB-6 and MB-6S.
   5. Base and Surface-mounted Counterflashing: Plates MB-4 and MB-4S.
   6. Base Flashing for Vented Base Sheet: Plates MB-5A and MB-5AS.
   7. Raised Perimeter Edge with Metal Flashing (Fascia Cap): Plates MB-2 and MB-2S.
8. Embedded Edge Metal Flashing Edge (Gravel-stop): Plates MB-3 and MB-3S.
10. Gutter at Draining Edge: Plates MB-22 and MB-22S.
11. Expansion Joint with Metal Cover: Plates MB-7 and MB-7S and Division 07 Section "Sheet Metal Flashing and Trim."
12. Expansion Joint with Premanufactured Cover: Plates MB-7A and MB-7AS.
13. Area Divider in Roof System: Plates MB-8 and MB-8S.
14. Equipment Support Curb: Plates MB-9 and MB-9S.
17. Raised Curb Detail at Rooftop HVAC Units, Premanufactured: Plates MB-12 and MB-12S.
18. Raised Curb Detail at Rooftop HVAC Units (Job site constructed wood curb): Plates MB-13 and MB-13S and Division 06 Section "Miscellaneous Rough Carpentry."
19. Skylight, Scuttle (Roof Hatch), and Smoke Vents: Plates MB-14 and MB-14S.
20. Penetration, Structural Member through Roof Deck: Plates MB-15 and MB-15S.
21. Penetration, Sheet Metal Enclosure for Piping Through Roof Deck: Plates MB-16 and MB-16S
22. Penetration, Isolated Stack Flashing: Plates MB-17 and MB-17S.
23. Penetration, Isolated Stack Flashing: Plates MB-17A and MB-17AS.
24. Penetration, Plumbing Vent: Plates MB-18 and MB-18S.
25. Penetration, Pocket: Plates MB-19 and MB-19S.
26. Roof Drain: Plates MB-20 and MB-20S.
27. Roof Drain: Plates MB-20A and MB-20AS.
28. Guide for Clearances between Pipes / Walls / Curbs - Table 4
29. Guide for Crickets and Saddles - Table 5
30. Guide for Edge Scuppers with Tapered Saddles - Table 6

3.04 INSULATION INSTALLATION

A. Comply with built-up roofing manufacturer's written instructions for installing roof insulation.
B. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.
C. Install tapered insulation under area of roofing to conform to slopes indicated.
D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
   1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inch (70 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
   1. Install insulation at minimum thickness of 2.5 inches. Match Existing total thickness at specific areas.

F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Loose lay all polyisocyanurate roofing insulations including crickets and saddles over metal deck.

I. Cover Board Installation: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.
   1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof. Gang Fasten all insulations through cover board to metal deck per wind uplift assembly. Follow FM Data Sheet 1-29, Table 6 for Presecurement fastening requirements (1 fastener per 5.33 sq ft)

3.05 TORCH-APPLIED ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
   1. Deck Type: Metal deck.
   2. Base Sheet: One.
   3. Number of Smooth-Surfaced SBS-Modified Asphalt Sheets: Two.
   4. Granular-Surfaced SBS-Modified Asphalt Cap Sheet:
B. Start installation of roofing membrane in presence of roofing system manufacturer’s technical personnel.

C. Cooperate with testing agencies engaged or required to perform services for installing roofing system.

D. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day’s work configured as recommended by NRCA Roofing Manual Appendix: Quality Control Guidelines - Insulation to protect new and existing roofing.

2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.

3. Remove temporary plugs from roof drains at end of each day.

4. Remove and discard temporary seals before beginning work on adjoining roofing.

3.06 BASE-SHEET INSTALLATION

A. Loose lay base sheet, allowing for a minimum of 5" shingle lap and a 6" end laps. Mechanically fasten base sheet to substrate at lap with specified mechanical fasteners at 6" on center. Allow for additional row of fasteners at center of sheet 6" on center. Adhere lap with specified Low rise Foam adhesive at lap. Provide for 6" wide strip of base sheet adhered over center row fasteners with specified Low Rise Foam Adhesive. Roll base sheet into adhesive with 6" wide roller.

B. Install lapped base-sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:

1. Mechanically fasten to substrate.

3.07 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install modified bituminous roofing membrane sheet and cap sheet according to roofing manufacturer’s written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:

1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.

2. Torch apply to substrate in accordance with manufacturer’s written instructions and NRCA CERTA guidelines.

B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Install roofing membrane sheets so side and end laps shed water. Completely bond and seal laps, leaving no voids.

1. Repair tears and voids in laps and lapped seams not completely sealed.

2. Apply roofing granules to cover exuded bead at laps while bead is hot.
3.08 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions, and as follows:

1. Extend base flashing up walls or parapets a minimum of 12 inches (300 mm) above built-up roofing and 6 inches (150 mm) onto field of roof membrane.

2. Prime substrates with asphalt primer if required by roofing system manufacturer.


4. Flashing Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer. Seal joints in flashing sheet. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

5. Flashing Sheet Application: Torch-apply flashing sheet to substrate.


B. Seal top termination of base flashing with a metal termination bar.

C. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.

D. Roof Drains: Set 30 by 30 inch (760 by 760 mm) square metal flashing in bed of asphalt roofing cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.

1. Install stripping according to roofing system manufacturer's written instructions.

3.09 WALKWAY INSTALLATION

A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.

1. Sweep away loose aggregate surfacing.

2. Set walkway pads in cold-applied adhesive.

3.10 WALL TREATMENT AND COATING INSTALLATION

A. Wall coating at previously coated walls above the roof membrane:

1. Pressure wash and clean masonry wall to be coated.

2. Provide repairs to cracks in masonry wall larger than 1/8” with urethane caulk.

3. Masonry walls are to be primed with specified primer. Refer to product data for coverage rates.
4. Apply three (3) coats of the specified elastomeric wall coating as recommended by the manufacturer in owner selected color.

3.11 FIELD QUALITY CONTROL

A. Roofing Inspector: Owner will engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation at commencement and upon completion.
   1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

C. Repair or remove and replace components of built-up roofing where test results or inspections indicate that they do not comply with specified requirements.
   1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.12 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION
07 62 00 SHEET METAL FLASHING AND TRIM

1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following sheet metal flashing and trim:
   1. Formed roof drainage system.
   2. Formed low-slope roof flashing and trim.
   3. Formed wall flashing and trim.
   4. Formed equipment support and curb flashing.

B. Related Sections include the following:
   1. Division 6 Section "Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
   2. Division 7 Section "SBS Modified Bituminous Membrane Roofing" for installing sheet metal flashing and trim integral with roofing membrane.

1.03 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

C. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.04 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: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
   1. Identify material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.

4. Details of expansion-joint covers, including direction of expansion and contraction.

C. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

1.05 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with the following. Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1. NRCA Roofing and Waterproofing Manual (Fifth Edition) for construction details and recommendations.


B. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.

2. Review methods and procedures related to sheet metal flashing and trim.

3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.

4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weather-tight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.07 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak-proof, secure, and non-corrosive installation.
2.00 PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2. 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.

2.02 SHEET METALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 316.
   1. Finish: No. 3 Polish

B. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet.
   1. Use prefabricated plumbing vent flashings with factory welded and sealed joints at all plumbing vents.
      a. Flange: 4” minimum
      b. Four (4) pounds per square foot minimum.

2.03 UNDERLAYMENT MATERIALS

A. Self-Adhering Sheet Underlayment, Smooth Surfaced: ASTM D 6163, Type I, Grade S, minimum of 0.080 in. thick; fiberglass reinforced, SBS/SIS modified asphalt; with perforated and split release film backing; cold applied.
   1. Performance requirements:
      a. Thickness: 0.080 in., ASTM D 6163-00
      b. Tensile Strength at 0 deg. F, 70 lbf/in (MD), 70 lbf/in (XD), ASTM D 6163-00
      c. Elongation at 0 deg. F, 1.0% (MD), 1% (XD), ASTM D 6163-00
      d. Tensile Strength at 77 deg. F, 30 lbf/in (MD), 30 lbf/in (XD), ASTM D 6163-00
      e. Elongation at 77 deg. F, 2% (MD), 2% (XD), ASTM D 6163-00
      f. Tear Strength at 77 deg. F, 35 lbf, ASTM D 6163-00
      g. Low Temperature Flexibility, 0 deg. F, ASTM D 6163-00

B. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.
2.04 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
   2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.

C. Solder for Lead: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.

D. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

E. Burning Rod for Lead: Same composition as lead sheet.

F. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.


2.05 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with the following recommendations that apply to design, dimensions, metal, and other characteristics of item indicated. Shop-fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
   1. NRCA Roofing and Waterproofing Manual (Fifth Edition) for construction details and recommendations.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
   1. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
D. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with NRCA and/or SMACNA recommendations.

E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-corrosive metal.
   1. Thickness: As recommended by the following for application but not less than thickness of metal being secured.
      a. NRCA Roofing and Waterproofing Manual (Fifth Edition) for construction details and recommendations.
      c. ANSI/SPRI ES-1, “Wind Design Standard for Edge Metal Systems Used with Low Slope Roof Systems”.

2.06 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by NRCA and/or SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
   1. Gutter Style: “A” or as shown on plans.
   2. Expansion Joints: Lap type.
   3. Fabricate from the following material:
      a. Stainless Steel: 24 gauge.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Fabricate downspouts from the following material:
      a. Stainless Steel: 24 gauge.

C. Parapet Over-flow Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof.
   1. Fabricate parapet scuppers from the following material:
      a. Stainless Steel: 24 gauge.

D. Supper Escutcheon Plates and Trim: Fabricate scupper escutcheon plates and trim of dimensions required with closure flange trim to exterior.
1. Fabricate parapet scuppers from the following material:
   a. Stainless Steel: 24 gauge.

2.07 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Caps: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Furnish with 6-inch-wide joint cover plates.
   1. Joint Style: Butt, with 6-inch-wide exposed cover plates.
   2. Fabricate roof edge flashings and fascia caps from the following material:
      a. Stainless Steel: 24 gauge.
   3. Fabricate continuous roof edge flashings and fascia cap anchor cleats form the following:
      a. Stainless Steel: 22 gauge.

B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.
   1. Joint Style: Butt, with 6-inch wide exposed cover plates.
   2. Optional Joint Style: Double Lock Standing Seam, with minimum 1” high seam.
   3. Fabricate copings from the following material:
      a. Stainless Steel: 24 gauge.
   4. Fabricate continuous coping anchor cleats form the following:
      a. Stainless Steel: 22 gauge.

C. Roof to Roof and Roof to Wall Transition Expansion Joint Cover: Fabricate from the following material:
   1. Stainless Steel: 24 gauge.

D. Counterflashing: Fabricate from the following material:
   1. Stainless Steel: 24 gauge.

E. Flashing Receivers: Fabricate from the following material:
   1. Stainless Steel: 24 gauge.

F. Roof-Penetration Flashing: Fabricate from the following material:
   1. Stainless Steel: 24 gauge.

G. Roof-Drain Flashing: Fabricate from the following material:
   1. Lead Sheet: Four (4) pounds per square foot minimum.

H. Continuous Anchor Cleats: Fabricate from the following material:
   1. Stainless Steel: 22 gauge.
2.08 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following material:
   1. Stainless Steel: 24 gauge.

2.09 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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

C. Appearance of Finished Work: 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.

3.00 EXECUTION

3.01 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.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
   1. Coat underside of sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing metal flashing 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.
C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
   1. Pre-painted, Metallic-Coated Steel: Use stainless-steel fasteners.
   2. Stainless Steel: Use stainless-steel fasteners.

H. Seal joints with elastomeric sealant as required for watertight construction.
   1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
   2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches except where pre-tinned surface would show in finished Work.
   1. Do not solder pre-painted, metallic-coated steel sheet.
   2. Stainless-Steel Soldering: Pre-tin edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
   3. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.
3.03 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to the following and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

1. NRCA Roofing and Waterproofing Manual (Fifth Edition) for construction details and recommendations.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with elastomeric sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets and straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Loosely lock straps to front gutter bead and anchor to roof deck.
3. Anchor and loosely lock back edge of gutter to continuous cleat.
4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
5. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Provide elbows at base of downspout to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

D. Parapet Over-flow Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
2. The bottom of each over-flow scupper must be placed at least two inches (2”) but no more than four inches (4”) above the primary roof drains.

E. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.04 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements and the following. Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
1. NRCA Roofing and Waterproofing Manual (Fifth Edition) for construction details and recommendations.


B. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch centers.

2. Anchor interior leg of coping with screw fasteners and washers at 18-inch centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten. Liquid flashing installed 8” above roof membrane is an acceptable alternative.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglet or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

1. Secure in a waterproof manner by means of interlocking folded seam or blind rivets and sealant. Provide wind clips per SMACNA and ANSI SPRI ES-1 at all counterflashings and edge metal.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.

2. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3. Liquid flashing installed 8” above roof membrane is an acceptable alternative.

3.05 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member. Liquid flashing installed 8” above roof membrane is an acceptable alternative.

3.06 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.
C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Latex joint sealants.

B. Related Sections:
   1. Section 07 84 46 “Fire Resistive Joint Systems” for sealing joints in fire-resistance-rated construction.
   2. Section 08 80 00 “Glazing” for glazing sealants.
   3. Section 09 29 00 “Gypsum Board” for sealing perimeter joints.

1.03 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Submit not fewer than eight pieces of each kind 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 joint-sealant manufacturer’s written instructions for corrective measures including use of specially formulated primers.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
   1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
   2. Conduct field tests for each application indicated below:
      a. Each kind of sealant and joint substrate indicated.
   3. Notify Architect 7 days in advance of dates and times when test joints will be erected.
   4. Arrange for tests to take place with joint-sealant manufacturer’s technical representative present.

1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.04 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer’s color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide samples with joint sealants in 1/2-inch (13-mm) wide joints formed between two 6-inch (150-mm) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI’s Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in “Preconstruction Testing” Article.

G. Field-Adhesion Test Reports: For each sealant application tested.

H. Warranties: Sample of special warranties.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer’s authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
   2. Test according to SWRI’s Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

E. Preinstallation Conference: Conduct conference at Project site.

1.07 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 F (5 C).
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.08 WARRANTY

A. Special Installer’s Warranty: Manufacturer’s standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 2 years from date of Substantial Completion.
B. Special Manufacturer’s Warranty: Manufacturer’s standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer’s written specifications for sealant elongation and compression.
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.

2.00 PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services’ “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”

D. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
E. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.

F. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

G. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer’s full range.

2.02 ELASTOMERIC JOINT SEALANTS

A. Low-Modulus Nonacid-Curing Silicone Sealant, Type I:

1. Products:
   a. Dow Corning; 790.
   b. GE Silicones; Silpruf
   c. Pecora Corporation; 890.
   d. Tremco; Spectrem 1
   e. Sonneborn Building Products Div., ChemRex Inc.; Omniseal.

2. Type and Grade: S (single component) and NS (nonsag).


4. Additional Movement Capability: Capable of 100 percent movement in extension and 50 percent movement in compression when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719.

5. Exposure: Use NT (nontraffic).

6. Substrates: Uses M, G, A, and, as applicable to joint substrates indicated, O.

7. Nonstaining to porous substrates when testing per ASTM C 1248 for substrates indicated.

B. Medium-Modulus Neutral-Curing Silicone Sealant, Type 2:

1. Products:
   a. Dow Corning; 791.
   b. Tremco; Spectrem 2.

2. Type and Grade: S (single component) and NS (nonsag).


4. Exposure: Use NT (nontraffic).

5. Substrates: Uses M, G, A, and, as applicable to joint substrates indicated, O.

6. Nonstaining to porous substrates when testing per ASTM C 1248 for substrates indicated.

C. Mildew-Resistant Silicone Sealant, Type 3:

1. Products:
Joint Sealants

SVC19127– TAMUCC University Center Wall Replacement

a. Dow Corning; 786 Mildew Resistant.

b. GE Silicones; Sanitary 1700.

c. Pecora Corporation; 898 Silicone Sanitary Sealant.

d. Tremco; Tremsil 600 White.

2. Type and Grade:  S (single component) and NS (nonsag).


4. Exposure:  Use NT (nontraffic).

5. Substrates:  Uses G, A, and, as applicable to joint substrates indicated, O.

D. Multicomponent Nonsag Urethane Sealant, Type 4:

1. For joints not subject to traffic and requiring additional movement capability, provide the following:
   a. Products:
      1). Pecora Corporation; Dynatrol II.
      2). Sika Corporation; Sikaflex - 2c NS.
      3). Tremco; Dymeric 240 FC.
   
   b. Type and Grade:  M (multicomponent) and NS (nonsag).

   c. Class:  25.

   d. Additional Movement Capability:  50 percent movement in extension and 50 percent in compression when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719.

   e. Exposure:  Use NT (nontraffic).

   f. Substrates:  Uses M, G, A, and, as applicable to joint substrates indicated, O.

2. For joints not subject to traffic, Type 5:

   a. Products:
      1). Bostik Inc.; Chem-Calk 500.
      2). Tremco; DYmeric.

   b. Type and Grade:  M (multicomponent) and NS (nonsag).

   c. Class:  25.

   d. Exposure:  Use NT (nontraffic).

   e. Substrates:  Uses M, G, A, and, as applicable to joint substrates indicated, O.

E. Single-Component Nonsag Urethane Sealant, Type 6:

1. For joints subject to traffic and not subject to traffic, provide the following:

   a. Products:
      1). Sika Corporation; Sikaflex - 1a.
Joint Sealants

   b. Type and Grade: S (single component) and NS (nonsag).
   c. Class: 25.

2. Exposure: Use NT (nontraffic).

3. Substrates: Uses M, G, A, and, as applicable to joint substrates indicated, O.

4. For joints not subject to traffic, provide the following:
   a. Products:
      1). Bostik Inc.; Chem-Chalk 900.
      2). Pecora Corporation; Dynatrol I.
      3). Tremco; DyMonic.
   b. Type and Grade: S (single component) and NS (nonsag).
   c. Class: 25.
   d. Exposure: Use NT (nontraffic).
   e. Substrates: Uses M, A, and, as applicable to joint substrates indicated.

F. Single-Component Pourable Urethane Sealant, Type 7

1. Products:
   b. Pecora Corporation; NR-201.

2. Type and Grade: S (single component) and P (pourable).


4. Exposure: Use T (traffic) and NT (nontraffic).

5. Substrates: Uses M, G, A, and, as applicable to joint substrates indicated, O.

2.03 LATEX JOINT SEALANTS

A. Latex Sealant: ASTM C 834.

1. Products:
   b. Pecora Corporation; AC-20.
   d. Tremco; Tremflex 834.

2.04 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer’s standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound.
transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation; AC-20 or FTR AIS-919.
   b. USG Corporation; SHEETROCK Acoustical Sealant.

2.05 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that 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. Cylindrical Sealant Backings: ASTM C 1330, of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
   1. Type: C O, or B.

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 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. Provide single backing to completely fill the joint per manufacturer’s recommendations.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.
3.00 EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer’s written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
   d. Portland cement plaster.
   e. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer’s written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer’s written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise indicated.
   4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
   5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C1193.
      a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.

2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer’s written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead 1/4 inch (6 mm) inside masking tape.

3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.

4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer’s written instructions.

3.04 FIELD QUALITY CONTROL

A. Contractor to provide field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
   b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer’s field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.05 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.06 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.07 JOINT SEALANT SCHEDULE

A. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
   1. Control and Expansion Joints in Cast-in-Place Concrete: Type 1, 5, 6 sealant.
   2. Control and Expansion Joints in Unit Masonry: Type 1, 5, 6 sealant.
   3. Joints between Metal Panels: Type 1, 5, 6 sealant.
   4. Joints between Different Materials Listed above: Type 1, 5, 6 sealant.
   5. Perimeter Joints between Materials Listed above and Frames of Doors and Windows: Type 1, 5, 6 sealant.
   6. Control and Expansion Joints in Ceiling and Overhead Surfaces: Type 1, 5, 6 sealant.

B. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   1. Control and Expansion Joints on Exposed Interior Surfaces of Exterior Walls: Type 1, 5, 6 sealant.
   2. Perimeter Joints of Exterior Openings Where Indicated: Type 1, 5 sealant.
   3. Vertical Control Joints on Exposed Surfaces of Interior Unit Masonry and Concrete Walls and Partitions: Type 1, 5, 6 sealant.
4. Perimeter Joints between Interior Wall Surfaces and Frames of Interior Doors, Windows, and Elevator Entrances: Type 1, 5, 6 sealant.

END OF SECTION
07 95 00  EXPANSION CONTROL

1.00  GENERAL

1.01  RELATED DOCUMENTS

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

1.02  SUMMARY

A. Section Includes:
   1. Interior expansion control systems.
   2. Exterior wall expansion control systems.

B. Related Requirements:
   1. Section 07 92 00 “Joint Sealants” for liquid-applied joint sealants and for elastomeric sealants without metal frames.

1.03  ACTION SUBMITTALS

A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches (150 mm) long in size.

C. Samples for Initial Selection: For each type of expansion control system indicated.
   1. Include manufacturer’s color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

D. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches (150 mm) long in size.

E. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
   1. Manufacturer and model number for each expansion control system.
   2. Expansion control system location cross-referenced to Drawings.
   3. Nominal joint width.
   5. Classification as thermal or seismic.
   7. Product options.
1.04 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

2.00 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.

2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.02 PERFORMANCE REQUIREMENTS

2.03 INTERIOR EXPANSION CONTROL SYSTEMS

A. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

B. Wall-to-Wall

1. Basis-of-Design Product: Construction Specialties Institute, Model FWF.

2. Design Criteria:

a. Nominal Joint Width: As indicated on Drawings.

b. Minimum Joint Width: 1 inch.

c. Maximum Joint Width: 2.5 inches.

3. Type: Flat seal.

a. Metal: Aluminum.

1). Finish: Mill.

b. Seal Material: Santoprene.


C. Wall Corner:

2. Design Criteria:
   a. Nominal Joint Width: As indicated on Drawings.
   b. Minimum Joint Width: .75 inch.
   c. Maximum Joint Width: 2.5 inches.

3. Type: Flat seal.
   a. Metal: Aluminum.
      1). Finish: Mill.
   b. Seal Material: Santoprene.

D. Wall-to-Ceiling:
   2. Design Criteria:
      a. Nominal Joint Width: As indicated on Drawings.
      b. Minimum Joint Width: 1.5 inches.
      c. Maximum Joint Width: 4 inches.
      d. Metal: Aluminum.
         1). Finish: Mill.
      e. Seal Material: Santoprene
         1). Color: White

E. Ceiling-to-Ceiling:
   2. Design Criteria:
      a. Nominal Joint Width: As indicated on Drawings.
      b. Minimum Joint Width: 1.25 inches
      c. Maximum Joint Width: 4 inches
   3. Type: Accordion.
      a. Metal: Aluminum.
         1). Finish: Mill.
      b. Seal Material: PVC.

2.04 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

A. Source Limitations: Obtain expansion control systems from single source from single manufacturer.
B. Wall-to-Wall
   2. Design Criteria:
      a. Nominal Joint Width: 2 inches.
      b. Minimum Joint Width: 1.25 inches.
      c. Maximum Joint Width: 3 inches
   3. Type: Cover plate.

2.05 ACCESSORIES

   A. Moisture Barriers: Manufacturer’s standard moisture barrier consisting of a continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary cover.

2.06 MATERIALS

   A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304 for plates, sheet, and strips.
      1. Remove tool and die marks and stretch lines or blend into finish.
   B. Elastomeric Seals: ASTM E1783; preformed elastomeric membranes or extrusions to be installed in metal frames.
   C. Compression Seals: ASTM E1612; preformed elastomeric extrusions having an internal baffle system and designed to function under compression.
   D. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.
   E. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.
   F. Moisture Barrier: Flexible elastomeric material, EPDM, minimum 45 mils thick.
   G. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
   H. Accessories: Manufacturer’s standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.07 GENERAL FINISH REQUIREMENTS

   A. Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.
   B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.08 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
   1. Run grain of directional finishes with long dimension of each piece.
   2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
   3. Directional Satin Finish: No. 4.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to expansion control system manufacturer’s written instructions.
B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

3.03 INSTALLATION

A. Comply with manufacturer’s written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.
B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.
   1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
   2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
   3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
   4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
5. Install frames in continuous contact with adjacent surfaces.
   a. Shimming is not permitted.

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.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer’s written instructions. Install with minimum number of end joints.
   1. Provide in continuous lengths for straight sections.
   2. Seal transitions according to manufacturer’s written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
   3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer to both frame interfaces before installing compression seals.

E. Foam Seals: Install with adhesive recommended by manufacturer.

F. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not overpressurize.

G. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

H. Moisture Barrier: Provide at all exterior joints and where indicated on Drawings. Provide drainage fittings at a maximum of 50 feet (15.2 m) or where indicated on Drawings.

3.04 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.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION
DIVISION 8
DOORS AND WINDOWS
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Exterior storefront framing.
   2. Storefront framing for window walls.
   3. Storefront framing for ribbon walls.
   4. Storefront framing for punched openings.
   5. Curtainwall systems.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.
   3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Initial Selection: For units with factory-applied color finishes.
D. Samples for Verification: For each type of exposed finish required, in manufacturer’s standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
   1. Joinery, including concealed welds.
   2. Anchorage.
   5. Flashing and drainage.

F. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Mockup Testing Submittals:
   1. Testing Program: Developed specifically for Project.
   2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
   3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.

B. Qualification Data: For Installer.

C. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

D. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.

E. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C1401. Include periodic quality-control reports.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample Warranties: For special warranties.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect’s approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

D. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of storefront systems.

1.08 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.

2. Testing shall be performed on mockups according to requirements in “Field Quality Control” Article.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.09 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including, but not limited to, excessive deflection.

   b. Noise or vibration created by wind and thermal and structural movements.

   c. Deterioration of metals, metal finishes and other materials beyond normal weathering.

   d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

2.00 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, registered in the State of Texas to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
   a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

E. Structural: Test according to ASTM E330 as follows:
   1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E283 for infiltration as follows:
   1. Fixed Framing and Glass Area:
      a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:
   1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
   1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 12 lbf/sq. ft. (575 Pa).
   2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies’ normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Energy Performance: Certify and label energy performance according to NFRC as follows:
   1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.66 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined according to NFRC 100.
   2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
   3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 55 as determined according to NFRC 500.

J. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E1886 and testing information in ASTM E1996 for Wind Zone 1.
   1. Large-Missile Test: For glazed openings located within 30 feet (9.1 m) of grade.
K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
   2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
      a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
      b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
      c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

L. Structural-Sealant Joints:
   1. Designed to carry gravity loads of glazing.
   2. Designed to produce tensile or shear stress of less than 20 psi (138-kPa).

M. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront system without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
   1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
   2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant’s internal strength.

2.02 MANUFACTURERS

A. Basis of Design Product:
   2. Curtainwall: Kawneer Company Inc: 1600 Wall System 2

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.03 FRAMING

A. Framing Members: Manufacturer’s extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   2. Glazing System: Retained mechanically with gaskets on two sides and structural sealant on two sides.
4. System Dimensions: Storefront - 2 ½” x 5” (63.5mm x 127 mm) Curtainwall - 2 ½” x 5” (63.5mm x 152.4 mm)

5. Finish: Clear anodic finish

6. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer’s standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   c. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
   d. Structural Profiles: ASTM B308/B308M.

2. Steel Reinforcement: Manufacturer’s standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
   a. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
   b. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
   c. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

2.04 GLAZING

A. Glazing: Comply with Section 08 80 00 “Glazing.”

B. Glazing Gaskets: Manufacturer’s standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

D. Structural Glazing Sealants: ASTM C1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.

E. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
2.05 ACCESSORIES

A. Fasteners and Accessories: Manufacturer’s standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
   1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Concealed Flashing: Manufacturer’s standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.06 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. 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.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
F. Storefront Framing: Fabricate components for assembly using screw-spline system.

2.07 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.08 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

3.00 EXECUTION

3.01 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 aluminum-framed storefront installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer’s written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.03 INSTALLATION

A. General:
   1. Comply with manufacturer’s written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:
   1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
   2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 “Joint Sealants” to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 08 80 00 “Glazing.”

G. Install weatherseal sealant according to Section 07 92 00 “Joint Sealants” and according to sealant manufacturer’s written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.04 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).

2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).

3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
   c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
   a. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.


   1. Test a minimum of four areas on each building facade.
   2. Repair installation areas damaged by testing.
D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION
1.00 GENERAL

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

1.02 SUMMARY
A. Section includes aluminum-framed assemblies incorporating fiberglass-sandwich panels as follows:
   1. Wall assemblies.

1.03 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum components of panel assemblies.
B. Shop Drawings: For panel assemblies.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.
C. Samples: In manufacturer’s standard size.
   1. For each type of fiberglass-sandwich panel.
   2. For each type of exposed finish for framing members.
D. Fabrication Samples: Of each framing system intersection and adjacent panels, made from 12-inch (305-mm) lengths of full-size framing members and showing details of the following:
   1. Joinery.
   2. Anchorage.
   4. fiberglass-sandwich panels.
   5. Flashing and drainage.
E. Delegated-Design Submittal: For panel assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: For each fiberglass-sandwich-panel assembly, for tests performed by a qualified testing agency.

C. Evaluation Reports: For fiberglass-sandwich-panel assemblies from ICC-ES.

D. Field quality-control reports.

E. Sample Warranties: For special warranties.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For panel assemblies to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: For fiberglass-sandwich panels, a qualified manufacturer whose facilities, processes, and products are monitored by an independent, accredited quality-control agency for compliance with applicable requirements in ICC-ES AC04 or ICC-ES AC177.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical panel assemblies as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 WARRANTY

A. Manufacturer’s Special Warranty: Manufacturer agrees to repair or replace fiberglass-sandwich panels that exhibit defects in materials or workmanship within specified warranty period.
   1. Defects include, but are not limited to, the following:
      a. Fiberbloom.
      b. Delamination of coating, if any, from exterior face sheet.
      c. Color change exceeding requirements.
      d. Delamination of panel face sheets from panel cores.
   2. Warranty Period: 10 years from date of Substantial Completion.
B. Special Aluminum-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.

1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
2. Warranty Period: 10 years from date of Substantial Completion.

2.00 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 “Quality Requirements,” to design fiberglass-sandwich-panel assemblies.

B. Structural Loads: As indicated on Drawings.

C. Deflection Limits:

1. Vertical Panel Assemblies: Limited to 1/90 of clear span for each assembly component.

D. Structural-Test Performance: Provide panel assemblies tested according to ASTM E330, as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not show evidence of deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not show evidence of material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Windborne-Debris-Impact-Resistance Performance: Provide panel assemblies that pass missile-impact and cyclic-pressure tests when tested according to ASTM E1886 and the testing information in ASTM E1996 for Wind [Zone 1] [Zone 2] [Zone 3] [Zone 4] zones indicated on Drawings Sheet S-1.

F. Large-Missile Test: For glazed openings located within 30 feet (9.1 m) of grade.

G. Water Penetration under Static Pressure: Provide panel assemblies that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

H. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
I. Energy Performance: Provide panel assemblies with performance properties specified, as indicated in manufacturer’s published test data, based on procedures indicated below and certified and labeled according to NFRC:

1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than 0.53 Btu/sq. ft. x h x deg F (3.00 W/sq. m x K) as determined according to NFRC 100.
2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas shall have a SHGC of no greater than 0.7 as determined according to NFRC 200.
3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. (1.50 L/s per sq. m) of fixed wall area as determined according to ASTM E283 at a minimum static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

2.02 FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

A. Fiberglass-Sandwich-Panel Assemblies: Translucent assemblies that are supported by aluminum framing and glazed with fiberglass-sandwich panels.
   1. Kalwall Corporation
   2. Major Industries, Inc

2.03 FIBERGLASS-SANDWICH PANELS

A. Fiberglass-Sandwich Panels: Uniformly colored, translucent, thermoset, fiberglass-reinforced-polymer face sheets bonded to both sides of a grid core.

B. Panel Thickness: 2-3/4 inches (70 mm).

C. Grid Core: Mechanically interlocked, extruded-aluminum I-beams, with a minimum flange width of 7/16 inch (11.1 mm).
   1. Extruded Aluminum: ASTM B221 (ASTM B221M), in alloy and temper recommended in writing by manufacturer.
   2. I-Beam Construction: [One piece, extruded aluminum].
   3. Grid Pattern: As indicated on Drawings.

D. Exterior Face Sheet:
   1. Thickness: 0.052 inch (1.32 mm) 0.060 inch (1.52 mm).
   2. Color: As selected by Architect from manufacturer’s full range.
   3. Protective Weathering Surface: Manufacturer’s standard.

E. Interior Face Sheet:
   1. Thickness: 0.045 inch (1.14 mm).
   2. Color: As selected by Architect from manufacturer’s full range.

F. Fiberglass-Sandwich-Panel Adhesive: Manufacturer’s standard for permanent adhesion of facings to cores.

G. Panel Strength:
1. Maximum Panel Deflection: 3-1/2 inches (89 mm) when a 4-by-12-foot (1.2-by-3.6-m) panel is tested according to ASTM E72 at 34 lbf/sq. ft. (1.6 kPa), with a maximum 0.090-inch (2.3-mm) set deflection after five minutes.

2. Panel Support Strength: Capable of supporting, without failure, a 300-lbf (1334-N) concentrated load when applied to a 3-inch- (76-mm-) diameter disk according to ASTM E661.

H. Panel Performance:
1. Self-Ignition Temperature: 650 deg F (343 deg C) or more according to ASTM D1929.
2. Smoke-Developed Index: 450 or less according to ASTM E84, or 75 or less according to ASTM D2843.
3. Combustibility Classification: Class CC2 based on testing according to ASTM D635.
4. Color Change: Not more than 3.0 units Delta E, when measured according to ASTM D2244, after outdoor weathering compliant with procedures in ASTM D1435.
   a. Outdoor Weathering Conditions: Sixty months in southern Florida.
5. Haze Factor: Greater than 90 percent when tested according to ASTM D1003.

2.04 ALUMINUM FRAMING SYSTEMS

A. Components: Manufacturer’s standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.

B. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).

C. Brackets and Reinforcements: Manufacturer’s standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.

D. Fasteners and Accessories: Manufacturer’s standard, corrosion-resistant, nonstaining, and nonbleeding fasteners and accessories; compatible with adjacent materials.
   1. At closures, retaining caps, or battens, use ASTM A193 (ASTM A193M), 300 series stainless-steel screws.
   2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.

F. Concealed Flashing: Corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

G. Exposed Flashing and Closures: Aluminum sheet not less than 0.040 inch (1.02 mm) thick, finished to match framing.

H. Framing Gaskets: Manufacturer’s standard.

I. Frame-System Sealants: As recommended in writing by manufacturer.

J. Corrosion-Resistant Coating: Cold-applied asphalt mastic, 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.

2.05 FABRICATION

A. Frame System Fabrication:
   1. Fabricate components that, when assembled, have the following characteristics:
      a. Profiles that are sharp, straight, and free of defects or deformations.
      b. Accurately fitted joints with ends coped or mitered.
      c. Internal guttering systems or other means to drain water passing through joints, and moisture migrating within assembly to exterior.
   2. Fabricate sill closures with weep holes and for installation as continuous component.
   3. Reinforce components as required to receive fastener threads.

B. Panel Fabrication: Factory assemble and seal panels.
   1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.
      a. White spots indicating lack of bond at intersections of grid-core members are limited in number to four for every 40 sq. ft. (3.7 sq. m) of panel and limited in diameter to 3/64 inch (1.2 mm).
   2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
   3. Fabricate panel to allow condensation within panel to escape.
   4. Reinforce panel corners.

2.06 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 INSTALLATION

A. General: Comply with manufacturer’s written instructions.
   1. Do not install damaged components.
   2. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
   3. Rigidly secure nonmovement joints.
   4. Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and immobilization of moving joints.
   5. Seal joints watertight unless otherwise indicated.

B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with corrosion-resistant coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.

C. Install components plumb and true in alignment with established lines and elevations.

D. Erection Tolerances: Install panel assemblies to comply with the following maximum tolerances:
   1. Alignment: Limit offset from true alignment to 1/32 inch (0.8 mm) where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches (76 mm); otherwise, limit offset to 1/8 inch (3.2 mm).
   2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3.2 mm in 3.7 m), but no greater than 1/2 inch (13 mm) over total length.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
   1. Water-Spray Test: Before installation of interior finishes has begun, panel assemblies shall be tested according to AAMA 501.2 and shall not show evidence of water penetration.

B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

C. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

END OF SECTION
08 80 00   GLAZING

1.00   GENERAL

1.01   RELATED DOCUMENTS

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

1.02   SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Doors.
   2. Storefront framing.
   3. Glazed entrances.

B. Related Sections:
   1. Division 08 Section “Aluminum-Framed Entrances and Storefronts” for window glazing

1.03   DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.04   PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
   1. Design Wind Pressures: As indicated on Drawings.
   2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
      a. Wind Design Data: As indicated on Drawings.
   3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.

5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.05 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.
   1. Tinted glass.
   2. Coated glass.
   3. Insulating glass.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Qualification Data: For installers.

F. Product Certificates: For glass and glazing products, from manufacturer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass and insulating glass.

H. H. Warranties: Sample of special warranties.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

C. 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.
D. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer’s name, type of glass, thickness, and safety glazing standard with which glass complies.

E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer’s written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.08 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 glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.09 WARRANTY

A. Manufacturer’s Special Warranty for Coated-Glass Products: Manufacturer’s standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer’s written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer’s Special Warranty on Insulating Glass: Manufacturer’s standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer’s written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

2.00 PRODUCTS

2.01 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0mm.

2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.02 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

1. Products: Subject to compliance with requirements, provide one of the following.
   a. AFG Industries, Inc.; Krystal Klear.
   b. Guardian Industries Corp.; Ultrawhite.
   c. Pilkington North America; Optiwhte.
   d. PPG Industries, Inc.; Starphire.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. For uncoated glass, comply with requirements for Condition A.
2. For coated vision glass, comply with requirements for Condition C (other coated glass).

C. Uncoated Tinted Float Glass: Class 2, complying with other requirements specified.

1. Tint Color: Bronze.
2. Visible Light Transmittance: 40 percent minimum.

2.03 INSULATING GLASS

A. Basis of design PPG Bronze – SOLARBAM 70XL (2) SOLARBRONZE + Clear Low E subject to compliance with requirements, provide products by one of the following:

   a. AFG Industries, Inc.; Krystal Klear.
   b. Guardian Industries Corp.; Ultrawhite.
c. Pilkington North America; Optiwhite.
d. PPG Industries, Inc.; Starphire.

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
   1. Sealing System: Dual seal, with manufacturer’s standard primary and secondary.
   2. Spacer: Manufacturer's standard spacer material and construction.
   3. Desiccant: Molecular sieve or silica gel, or blend of both.
   4. Maximum solar heat gain coefficient of 0.20 and U-Value summer of 0.26

C. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.

2.04 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
   1. EPDM complying with ASTM C 864.
   2. Silicone complying with ASTM C 1115.
   3. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
   1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.05 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide 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. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer’s full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following.
      a. Dow Corning Corporation; 790.
      b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
      d. Pecora Corporation; 890.
      e. Sika Corporation, Construction Products Division; SikaSil-C990.
      f. Tremco Incorporated; Spectrem 1.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.06 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; 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; 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; and complying with AAMA 800 for the following types:
   1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
   2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.07 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 of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.08 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Provide glazing units per manufacturers recommendations for storefront and curtainwall systems specified.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.03 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. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

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 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).
   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. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. 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.

L. 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.

3.04 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 right before each glazing unit is installed.

F. 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.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.
3.05  GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.06  SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.07  LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer’s written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.08  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. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing 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.

3.09 WASH GLASS ON BOTH EXPOSED SURFACES IN EACH AREA OF PROJECT NOT MORE THAN FOUR DAYS BEFORE DATE SCHEDULED FOR INSPECTIONS THAT ESTABLISH DATE OF SUBSTANTIAL COMPLETION. WASH GLASS AS RECOMMENDED IN WRITING BY GLASS MANUFACTURER.

END OF SECTION
DIVISION 9
FINISHES
1.00 GENERAL

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

1.02 SUMMARY
A. This Section includes non-load-bearing steel framing members for the following applications:
   1. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
B. Related Sections include the following:
   1. Division 05 Section "Cold-Formed Metal Framing" for load-bearing and non-load-bearing wall studs and ceiling joists.
   2. Division 07 Section "Thermal Insulation" for insulation installed with Z-shaped furring members.
   3. Division 09 Section "Portland Cement Plastering" for metal lath supported by non-load-bearing steel framing.
   4. Division 09 Section "Gypsum Board" for gypsum board.

1.03 SUBMITTALS
A. Product Data: For each type of product indicated.

1.04 QUALITY ASSURANCE
A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.00 PRODUCTS

2.01 SUSPENSION SYSTEM COMPONENTS
A. 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.
B. Hanger Attachments to Concrete:
   1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that
imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Postinstalled, chemical anchor or Postinstalled, expansion anchor.

C. 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) and minimum 1/2-inch- (12.7-mm-) wide flanges.
   1. Depth: 2-1/2 inches (64 mm)

E. Furring Channels (Furring Members):
   1. Steel Studs: ASTM C 645.
      a. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm)
      b. Depth: 3-5/8 inches (92.1 mm).

F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      b. Chicago Metallic Corporation; Fire Front 650-C Drywall Furring System.
      c. USG Corporation; Drywall Suspension System.

2.02 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

3.00 EXECUTION

3.01 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.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.03 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.

2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.04 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

END OF SECTION
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Exterior portland cement plasterwork (stucco) on metal lath
   2. Water moisture/vapor drainage mat.

B. Related Sections:
   1. Division 05 Section "Cold-Formed Metal Framing" for structural, load-bearing (transverse and axial) steel studs and joists that support lath and portland cement plaster.
   2. Division 06 Section "Miscellaneous Rough Carpentry" for wood framing and furring included in portland cement plaster assemblies.
   3. Division 06 Section "Sheathing" for sheathing and water-resistant barriers included in portland cement plaster assemblies.
   4. Division 07 Section "Thermal Insulation" for thermal insulations and vapor retarders included in portland cement plaster assemblies.
   5. Division 07 Section “Sheet Metal Flashing and Trim” for flashing at openings and penetrations.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.

C. Samples for Verification: For each type of factory-prepared, colored and textured finish coat indicated; 12 by 12 inches (305 by 305 mm), and prepared on rigid backing.

1.04 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide portland cement plaster assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

B. Mockups: Before plastering, install mockups of at least 100 sq. ft. (9.3 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Install mockups for each type of finish indicated.
For interior plasterwork, simulate finished lighting conditions for review of mockups.

1.05 DELIVERY, STORAGE, AND HANDLING

A. 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.

1.06 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Exterior Plasterwork:

1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.

2. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C).

3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

2.00 PRODUCTS

2.01 METAL LATH


1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
   b. CEMCO.
   c. Clark Western Building Systems.
   d. Dietrich Metal Framing; a Worthington Industries company.
   e. MarinoWARE.
   f. Phillips Manufacturing Co.

2. Diamond-Mesh Lath: Flat and Self-furring, 3.4 lb/sq. yd. (1.8 kg/sq. m).

B. Wire-Fabric Lath:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Davis Wire Corporation; a Heico Wire Group company.
   b. Jaenson Wire Company.
c. Keystone Steel & Wire Co.

C. Paper Backing: FS UU-B-790, Type I, Grade D, Style 2 vapor-permeable paper.
   1. Provide paper-backed lath at all exterior locations.

D. Drainage Mat
   1. Randomly oriented geometric patterned drainage and ventilation mat designed to
      eliminate moisture and moisture vapor in wall applications
   2. Product: Driwall Rainscreen 020-1 as manufactured by Keene Building Products.
   3. Physical Characteristics: Three-dimensional mat heat laminated to a non-woven
      lightweight, vapor permeable fabric. The monofilament mat is heat welded at the
      junctions to form a resilient structure that isolates veneer from the back-up.
      a. 0.25 inches (6 mm) thick
      b. 12.7 oz/sq. yd. (431 g/sq m) total weight.
      c. 48 inches (122 cm) wide.
      d. 65 feet (19.8 m) roll length.

E. Material: UV stabilized polypropylene.
   1. Class A flame spread per ASTM E84.
   2. ASTM ASTM E 2273 - Standard Test Method for Determining the Drainage Efficiency of
   3. Application: Provide at stucco veneer

2.02 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with
   thicknesses and number of plaster coats required.

B. Metal Accessories:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers
      offering products that may be incorporated into the Work include, but are not limited to,
      the following:
      a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
      b. CEMCO.
      c. Clark Western Building Systems.
      d. Dietrich Metal Framing; a Worthington Industries company.
      e. MarinoWARE.
      f. Phillips Manufacturing Co.
   2. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A
      653/A 653M, G60 (Z180) zinc coating.


5. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.

6. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.

7. Two-Piece Expansion Joints: Fabricated from zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch (6.34 to 16 mm) wide; with perforated flanges.

2.03 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in portland cement plaster.

C. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.

D. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

E. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter, unless otherwise indicated.

2.04 PLASTER MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's sample.

C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

D. Sand Aggregate: ASTM C 897.

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Bonsal American, an Oldcastle Company; Marblesil Stucco Mix.


d. Florida Stucco; Florida Stucco.

e. LaHabra, a brand of ParexLaHabra, Inc.; Exterior Stucco Color Coat.


g. QUIKCRETE; QUIKCRETE Finish Coat Stucco, No. 1201.

h. Shamrock Stucco LLC; Exterior Stucco.

i. SonoWall, BASF Wall Systems, Inc.; Thoro Stucco.

j. USG Corporation; Oriental Exterior Finish Stucco.

2. Color: As indicated on drawings.

2.05 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.

1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. (0.6 kg of fiber/cu. m) of cementitious materials.

B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:

1. Portland Cement Mixes:
   a. Scratch Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
   b. Brown Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

C. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters comply with manufacturer's written instructions.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.03 INSTALLING METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C 1063.
   1. Flat-Ceiling and Horizontal Framing: Install flat diamond-mesh lath.

3.04 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.
B. Reinforcement for External Corners:
   1. Install lath-type, external-corner reinforcement at exterior locations.
C. Install flashing at all sided of windows and openings directing any moisture out from behind the plaster.
D. Control Joints: Install control joints at locations indicated on Drawings or in specific locations approved by Architect for visual effect, if not shown on plans, as follows:
   1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
      a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
      b. Horizontal and other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).
   2. At distances between control joints of not greater than 18 feet (5.5 m) o.c.
   3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
   4. Where control joints occur in surface of construction directly behind plaster.
   5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.05 PLASTER APPLICATION

A. General: Comply with ASTM C 926.
   1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.
   2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctions with metal.
   3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
B. Walls; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4-inch (19-mm) thickness.
1. Portland cement mixes.

C. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4 inch (19 mm) thick on concrete.

1. Portland cement mixes.

D. Plaster Finish Coats: Apply to provide float finish to match Architect's sample.

E. Concealed Exterior Plasterwork: Where plaster application will be used as a base for adhered finishes, omit finish coat.

3.06 DRAINAGE MAT INSTALLATION

A. Install in accordance with manufacturer’s instructions

B. Inspection of Wall Conditions and Weather Barrier/Building Wrap: Ensure that the wall is free from structural defects, that any membranes or flashing are properly installed and that the final system will have a path for moisture to escape from the wall.

1. Install building paper or house wrap and flashing to manufacturers’ recommendations.

2. Place drainage mat horizontally against exterior wall fabric side out, entangled core to the building interior. Starting at the bottom of the wall, position the first piece of drainage mat where the bottom edge of the stone will meet the ledger board.

3. Mechanically fasten with a staple hammer, large head nail or washer and screw one fastener for each square foot (0.1 sq. m). When installing over concrete or block back-up walls that do not accept mechanical fasteners hold in place with small dabs of glue every 2.0 feet (0.61 m). Do not fasten through flashing.

4. Seam adjacent piece with the selvage edge overlapping the top of the lower drainage mat piece.

5. Install expanded metal lathe over the drainage mat according to the manufacturer’s recommendations.

6. Apply stucco according to manufacturer’s recommendations. Provide a weep method for ventilation and drainage.

7. Trim drainage mat around all penetrations, windows and doors so that the material is flush to the flashing.

3.07 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.08 PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Interior gypsum board.

B. Related Sections include the following:
   1. Division 05 Section "Cold-Formed Metal Framing" for load-bearing steel framing that supports gypsum board.
   2. Division 06 Section "Rough Carpentry" for wood framing and furring that supports gypsum board.
   3. Division 06 Section "Sheathing" for gypsum sheathing.
   4. Division 07 Section "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
   5. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.
   6. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.
   2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.04 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.05 STORAGE AND HANDLING
A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer’s written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

2.00 PRODUCTS

2.01 PANELS, GENERAL

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.02 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Gypsum Co.
      b. BPB America Inc.
      c. G-P Gypsum.
      d. Lafarge North America Inc.
      e. National Gypsum Company.
      f. PABCO Gypsum.
      g. Temple.
      h. USG Corporation.

B. Regular Type:
   1. Thickness: 5/8 inch (12.7 mm).
   2. Long Edges: Tapered

C. Type X:
1. **Thickness**: 5/8 inch (15.9 mm).

D. **Ceiling Type**: Manufactured to have more sag resistance than regular-type gypsum board.
   1. **Thickness**: 5/8 inch.
   2. **Long Edges**: Tapered.

E. **Abuse-Resistant Type**: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board.
   1. **Core**: 5/8 inch (15.9 mm), Type X.
   2. **Long Edges**: Tapered.

F. **Moisture- and Mold-Resistant Type**: With moisture- and mold-resistant core and surfaces.
   1. **Core**: 5/8 inch (15.9 mm), Type X.
   2. **Long Edges**: Tapered.

2.03 **TRIM ACCESSORIES**

A. **Interior Trim**: ASTM C 1047.
   1. **Material**: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
   2. **Shapes**:
      a. Cornerbead.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. L-Bead: L-shaped; exposed long flange receives joint compound.
      e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      f. Expansion (control) joint.
      g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. **Aluminum Trim**: Extruded accessories of profiles and dimensions indicated for reveals.
   1. **Manufacturers**: Subject to compliance with requirements, provide products by one of the following:
      a. Fry Reglet Corp.
      b. Gordon, Inc.
      c. Pittcon Industries.
   2. **Aluminum**: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
   3. **Finish**: Class II clear anodic finish.

2.04 **JOINT TREATMENT MATERIALS**
A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.

C. 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 joints and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use [setting-type, sandable topping] [drying-type, all-purpose] compound.
   4. Finish Coat: For third coat, use [setting-type, sandable topping] [drying-type, all-purpose] compound.

2.05 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.
   1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. 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.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."
   1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

2.06 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

3.00 EXECUTION
3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and
closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.03 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Ceiling Type: As indicated on Drawings.
   2. Type X: Vertical surfaces, unless otherwise indicated.

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
   1. 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.
   2. On 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.
   3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer’s written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.04 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer’s written instructions.
B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners.
   2. LC-Bead: Use at exposed panel edges.
   3. L-Bead: Use where indicated.
   4. U-Bead: Use at exposed panel edges where indicated.
   5. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.05 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 2: Where indicated on Drawings.
   3. Level 3: Here indicated on Drawing.
   4. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
      a. Primer and its application to surfaces are specified in other Division 09 Sections.
   5. Level 5: Where indicated on Drawings.
      a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.06 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, de-spite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer’s written recommendations.
3.07 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION
09 51 13 ACOUSTICAL PANEL CEILINGS

1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes
   1. Acoustical panels.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.03 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members.
   2. Method of attaching hangers to building structure.
      a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
   3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Panel: Set of 6-inch-(150-mm-) square Samples of each type, color, pattern, and texture.
   2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-(300-mm-) long Samples of each type, finish, and color.
E. Qualification Data: For testing agency.
F. Field quality-control test reports.
G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
H. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.
I. Maintenance Data: For finishes to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations:
   1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
   2. Suspension System: Obtain each type through one source from a single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
   1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
      a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
      b. Identify materials with appropriate markings of applicable testing and inspecting agency.
   2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
      a. Smoke-Developed Index: 450 or less.

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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, 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.

1.07 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. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.08 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.

1.09 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. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.

2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

2.00 PRODUCTS

2.01 ACOUSTICAL PANELS, GENERAL

A. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 10 percent by weight.

B. 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 NRC: 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.
C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

E. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.02 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Armstrong World Industries, Inc.
   2. BPB USA
   3. Chicago Metallic Corporation
   4. Ecophon CertainTeed, Inc
   5. Tectum Inc.
   6. USG Interiors, Inc.

B. Basis-of-Design Product: Armstrong Cortega. Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

C. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:
   1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
   2. Pattern: C D.

D. Color: White

E. LR: Not less than 0.82

F. NRC: Not less than 0.55

G. CAC: Not less than 35.

H. Edge/Joint Detail:
   1. Tile AC-1 Square
I. Thickness: 5/8 inch
J. Modular Size: 24 by 24 inches

2.03 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 requirements in ASTM C 635.

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.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
   a. Type: Postinstalled expansion anchors.
   b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
4. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- (3.5-mm-) diameter wire.

E. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.

2.04 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

1. Armstrong World Industries, Inc..
2. Chicago Metallic Corporation; <Insert product name or designation>.
3. USG Interiors, Inc.; <Insert product name or designation>.

C. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Prelude or a comparable product by one of the following:

D. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.

2. End Condition of Cross Runners: Butt-edge type.
3. Face Design: Flat, flush.
5. Cap Finish: Painted white

2.05 METAL EDGE MOLDINGS AND TRIM

A. Products: Subject to compliance with requirements, provide one of the following:

   1. Armstrong World Industries, Inc.
   2. Chicago Metallic Corporation; USG Interiors, Inc

B. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Prelude ML or a comparable product by one of the following:

C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer’s standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

   1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.

   2. 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.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, including 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 with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

   1. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 PREPARATION

A. 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.

3.03 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

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 to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. 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.

4. 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.

5. 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 and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

8. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

9. Do not attach hangers to steel deck tabs.

10. Do not attach hangers to steel roof deck. Attach hangers to structural members.
11. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.

12. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

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 (3.2 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 fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. As indicated on reflected ceiling plans.
      b. Install panels with pattern running in one direction parallel to long axis of space.
      c. Install panels in a basket-weave pattern.
   2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
   3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   4. 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.
   5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
   6. 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.
7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer’s written instructions.

8. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.04 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer’s written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Resilient base.

B. Related Sections:

1. Division 09 Section "Resilient Tile Flooring" for resilient floor tile.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.04 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Mockups: Provide resilient products with mockups specified in other Sections.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).
1.06 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

1.07 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. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

2.00 PRODUCTS

2.01 RESILIENT BASE <RB-1>

A. Resilient Base:

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

a. Allstate Rubber Corp.; Stoler Industries.

b. Armstrong World Industries, Inc.

c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.

d. Flexco, Inc.

e. Johnsonite.

f. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
g. Roppe Corporation, USA.


C. Wall Base: ASTM F 1861.
   1. Roppe Corporation; Pinnacle Rubber Base
   2. Type (Material Requirement): TS (rubber, vulcanized thermoset).
   4. Style: Profile #10
   5. Minimum Thickness: 0.125 inch (3.2 mm).
   6. Height: 4 inches (102 mm).
   7. Lengths: Cut lengths 48 inches (1219 mm) long or coils in manufacturer's standard length.
   8. Outside Corners: Job formed or premolded.
   9. Inside Corners: Job formed or premolded.
   10. Surface: Smooth.

D. Colors and Patterns: As shown on finish schedule.

2.02 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
      b. Flexco, Inc.
      c. Johnsonite.
      d. Roppe Corporation, USA.

B. Description: Transition strips.

C. Material: Rubber.

D. Profile and Dimensions: As indicated.
E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Cove Base Adhesives: Not more than 50 g/L.
   b. Rubber Floor Adhesives: Not more than 60 g/L.

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

D. 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.

E. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. 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.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to manufacturer’s written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.

4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass 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 relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.

   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
   2. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 RESILIENT BASE INSTALLATION

A. Comply with manufacturer’s written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. Preformed Corners: Install preformed corners before installing straight pieces.

G. Job-Formed Corners:
1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible.

3.04 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.

2. Tightly adhere to substrates throughout length of each piece.

3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet, resilient floor covering that would otherwise be exposed.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. 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.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Vinyl composition floor tile.

B. Related Sections:
   1. Section 09 65 13 “Resilient Base and Accessories” for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   1. Show details of special patterns.

C. Samples for Initial Selection: For each type of floor tile indicated.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.06 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.07 QUALITY ASSURANCE

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. 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 mockups for floor tile including resilient base and accessories.
a. Size: Minimum 100 sq. ft. (9.3 sq. m) for each type, color, and pattern in locations directed by Architect.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 F (10 C) or more than 90 F (32 C). Store floor tiles on flat surfaces.

1.09 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 F (21 C) or more than 95 F (35 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. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 F (13 C) or more than 95 F (35 C).

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

2.00 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

2.02 VINYL COMPOSITION FLOOR TILE: VCT -1, VCT -2, VCT -3

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   1. AB ColorPlus, American Biltrite (Canada) Ltd.;
   2. Armstrong World Industries, Inc.;
   3. Congoleum Corporation;
   4. Mannington Mills, Inc.;
   5. Tarkett, Inc.;
   6. Vinylasa Tile, Distributed by American Tile Inc.;

B. Tile Standard: ASTM F1066, Class 2, through-pattern tile.

C. Wearing Surface: Meets ADA slip requirements.

D. Thickness: 0.125 inch (3.2 mm).

E. Size: 12 by 12 inches (305 by 305 mm).
F. Colors and Patterns: As selected by Architect from full range of industry colors.

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

1. Joint-Sealant Color: As selected by Architect from manufacturer’s full range to match floor tile.

D. Sealers and Finish Coats for Resilient Terrazzo Floor Tile: Premium-type products as recommended by manufacturer for resilient terrazzo floor tile.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. 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 floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to manufacturer’s written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

a. Perform relative humidity test using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 FLOOR TILE INSTALLATION

A. Comply with manufacturer’s written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
   1. Lay tiles in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.04 CLEANING AND PROTECTION

A. Comply with manufacturer’s written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile 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.
C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
   1. Apply one coat(s).

E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.

F. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products.
   1. Sealer: Apply two base coats of liquid sealer.
   2. Finish: Apply two coats of liquid floor finish.

G. Cover floor tile until Substantial Completion.

END OF SECTION
09 68 13    TILE CARPETING

1.00      GENERAL

1.01      RELATED DOCUMENTS

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

1.02      SUMMARY

A. Section includes modular, tufted carpet tile.
B. Related Requirements:
   1. Section 09 65 13 “Resilient Base and Accessories” Section 09 65 19 “Resilient Tile Flooring” for resilient wall base and accessories installed with carpet tile.

1.03      PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
      a. Review delivery, storage, and handling procedures.
      b. Review ambient conditions and ventilation procedures.
      c. Review subfloor preparation procedures.

1.04      ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer’s written data on physical characteristics, durability, and fade resistance.
   2. Include installation recommendations for each type of substrate.
B. Shop Drawings: Show the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Carpet tile type, color, and dye lot.
   3. Type of subfloor.
   4. Type of installation.
   5. Pattern of installation.
   6. Pattern type, location, and direction.
   7. Pile direction.
   8. Type, color, and location of insets and borders.
   9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch (300-mm) long samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.07 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.08 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockups at locations and in sizes shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
1.09 DELIVERY, STORAGE, AND HANDLING
   A. Comply with CRI 104.

1.10 FIELD CONDITIONS
   A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
   B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
   C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
   D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY
   A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
      1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
      2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
      3. Warranty Period: 20 years from date of Substantial Completion.

2.00 PRODUCTS

2.01 CARPET TILE: CPT-1
   A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   B. Basis-of-Design Product: Subject to compliance with requirements, provide Shaw Carpet, No Rules Collection or comparable product by one of the following:
   C. Color: As selected by Architect from manufacturer’s full range.
   D. Pattern: Link Tile.
   E. Fiber Type: Eco Solution q Nylon.
   F. Pile Characteristic: Multi-level pattern-loop pile.
   G. Pile Thickness: .112 (2.84 mm) for finished carpet tile according to ASTM D6859.
   H. Stitches: 9 per inch (mm).
I. Gage: 1/12 per inch.
J. Surface Pile Weight: 17 oz./576.4 (g/sq. m).
K. Primary Backing/Backcoating: Synthetic.
L. Secondary Backing: Ecoworx tile.
M. Size: 24 by 24 inches (610 by 610 mm).
O. Performance Characteristics: As follows:
   1. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D7330.
   2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
   3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D2646.
   4. Tuft Bind: Not less than 8 lbf (36 N) according to ASTM D1335.
   5. Delamination: Not less than 4 lbf/in. (18 N/mm) according to ASTM D3936.
   6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
   7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
   8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
   9. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.
   10. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.02 INSTALLATION ACCESSORIES
A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

3.00 EXECUTION
3.01 EXAMINATION
A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:

   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.

   2. Subfloor finishes comply with requirements specified in Section 03 30 00 “Cast-In-Place Concrete” for slabs receiving carpet tile.

   3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

3.02 PREPARATION

   A. General: Comply with CRI 104, Section 6.2, “Site Conditions; Floor Preparation,” and with carpet tile manufacturer’s written installation instructions for preparing substrates indicated to receive carpet tile installation.

   B. Use trowelable leveling and patching compounds, according to manufacturer’s written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer’s written instructions.

   C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

3.03 INSTALLATION

   A. General: Comply with CRI 104, Section 14, “Carpet Modules,” and with carpet tile manufacturer’s written installation instructions.

   B. Installation Method: As recommended in writing by carpet tile manufacturer.

   C. Maintain dye lot integrity. Do not mix dye lots in same area.

   D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

   E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

   F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

   G. Install pattern parallel to walls and borders.

3.04 CLEANING AND PROTECTION

   A. Perform the following operations immediately after installing carpet tile:

      1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.

B. Protect installed carpet tile to comply with CRI 104, Section 16, “Protecting Indoor Installations.”

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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 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 or 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. Finished mechanical and electrical equipment.
      b. Light fixtures.
      c. Overhead coiling door
   2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      a. Furred areas.
      b. Ceiling plenums.
      c. Utility tunnels.
      d. Duct shafts.
   3. Finished metal surfaces include the following:
      a. Anodized aluminum.
      b. Stainless steel.
      c. Galvanized metal.
   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.

D. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
   2. Division 9 Section "Protective Coatings" for industrial paints and maintenance and for special coatings.

1.03 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.

1.04 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

1. Material List: 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: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

3. Manufactures standard color selection chart or packet of color chips.

4. A pretreatment and coating plan for galvanized items required to be painted shall be submitted for approval. The plan shall include a description of the pretreatment method, the time after galvanizing that pretreatment will occur and the location of the item during pretreatment

B. Samples for Initial Selection: For each type of finish-coat material indicated.

1. After color selection, Architect will return selected color chips for surfaces to be coated.
1.05 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. Notice of galvanized surface pretreatment operations shall be given to the Architect at least 48 hours in advance. Reasonable access to facilities where pretreatment occurs shall be provided to the Architect.

1.06 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.

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.

1.07 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.
2.00 PRODUCTS

2.01 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:

1. Benjamin Moore & Co. (Benjamin Moore).
2. Coronado Paint Company (Coronado).
3. ICI Dulux Paint Centers (ICI Dulux Paints).
5. PPG Industries, Inc. (Pittsburgh Paints).

2.02 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 range.

2.03 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.

1. Benjamin Moore; Moorcraft Super Craft Latex Block Filler No. 285: Applied at a dry film thickness of not less than 8.1 mils (0.206 mm).
2. Benjamin Moore; Moore's IMC Latex Block Filler No. M88: Applied at a dry film thickness of not less than 8.1 mils (0.206 mm).
3. Coronado; 946-11 Super Kote 5000 Commercial Latex Block Filler: Applied at a dry film thickness of not less than 8.4 mils (0.214 mm).
4. ICI Dulux Paints; Bloxfil 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).
5. Kelly-Moore; 521 Fill and Prime Acrylic Block Filler: Applied at a dry film thickness of not less than 10.0 mils (0.254 mm).

6. M. A. B. Paint; Block Kote No. 1000 Acrylic Latex Block Filler 064-145: Applied at a dry film thickness of not less than 12.0 mils (0.305 mm).

7. Pittsburgh Paints; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than 6.0 to 12.5 mils (0.152 to 0.318 mm).

8. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils (0.203 mm).

2.04 EXTERIOR PRIMERS


1. Benjamin Moore; Moore’s IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

2. Coronado; 35-147 Rust Scat Alkyd Metal Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

3. ICI Dulux Paints; 4160-XXXX Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

4. Kelly-Moore; 1711 Kel-Guard Alkyd White Rust Inhibitive Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

5. Kelly-Moore; 5725 DTM-Acrylic Metal Primer: Applied at a dry film thickness of not less than 1.8 mils (0.048 mm).

6. M. A. B. Paint; Rust-O-Lastic Anti-Corrosive Primer 073-132: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

7. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

8. 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).

2.05 INTERIOR PRIMERS

A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.

1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).

2. Coronado; 40-11 Super Kote 5000 Latex Primer-Sealer: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).

3. ICI Dulux Paints; 3030-1200 Bond-Prep Interior/Exterior Waterborne Pigmented Bonding Primer: Applied at a dry film thickness of not less than 1.8 mils (0.046 mm).

4. Kelly-Moore; 971 Acry-Prime Interior Latex Primer/Sealer: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
5. M. A. B. Paint; Fresh Kote Vinyl Primer 037-100: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

6. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).

7. Sherwin-Williams; PrepRite Masonry Primer B28W300: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).


1. Benjamin Moore; Moore’s IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

2. Coronado; 35-147 Rust Scat Alkyd Metal Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

3. ICI Dulux Paints; 4130-6130 Devshield Rust Penetrating Metal Primer: Applied at a dry film thickness of not less than 2.2 mils (0.056 mm).

4. ICI Dulux Paints; 4160-6130 Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

5. Kelly-Moore; 1711 Kel-Guard Alkyd White Rust Inhibitive Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

6. M. A. B. Paint; Rust-O-Lastic Anti-Corrosive Primer 073-132: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

7. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

8. 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).

2.06 EXTERIOR FINISH COATS


1. Benjamin Moore; Moore’s IMC Urethane Alkyd Enamel M22: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

2. Coronado; 1223 Line Super Kote 5000 High Gloss Alkyd Enamel: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

3. ICI Dulux Paints; 4308-XXXX Devguard Alkyd Industrial Gloss Enamel: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

4. Kelly-Moore; 1700 Kel-Guard Gloss Alkyd Rust Inhibitive Enamel: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

5. M. A. B. Paint; Rust-O-Lastic Finish Coating 074 Line: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

6. Pittsburgh Paints; 7-814 Pittsburgh Paints Industrial Gloss-Oil Interior/Exterior Enamel: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
2.07 INTERIOR FINISH COATS

   1. Benjamin Moore; Moorcraft Super Spec Latex Eggshell Enamel No. 274: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
   2. Coronado; 30-Line Super Kote 5000 Latex Eggshell Enamel: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
   3. ICI Dulux Paints; 1402-XXXX Dulux Professional Acrylic Eggshell Interior Wall & Trim Enamel: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
   4. Kelly-Moore; 1610 Sat-N-Sheen Interior Latex Low Sheen Wall and Trim Finish: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
   5. Kelly-Moore; 1686 Dura-Poxy Eggshell Acrylic Enamel: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
   6. M. A. B. Paint; Fresh Kote Latex Satin Eggshell Enamel 405 Line: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
   7. Pittsburgh Paints; 6-400 Series SpeedHide Eggshell Acrylic Latex Enamel: Applied at a dry film thickness of not less than 1.25 mils (0.032 mm).
   8. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).

B. Interior Semigloss Alkyd Enamel: Factory-formulated semigloss alkyd enamel for interior application.
   1. Benjamin Moore; Moorcraft Super Spec Alkyd Semi-Gloss Enamel No. 271: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
   2. Coronado; 27-Line Super Kote 5000 Alkyd Semi-Gloss Enamel: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
   3. ICI Dulux Paints; 1516-XXXX Ultra-Hide Alkyd Semi-Gloss Interior Wall & Trim Enamel: Applied at a dry film thickness of not less than 1.7 mils (0.043 mm).
   4. Kelly-Moore; 1630--Kel-Cote Interior Alkyd Semi-Gloss Enamel: Applied at a dry film thickness of not less than 2.2 mils (0.056 mm).
   5. M. A. B. Paint; Fresh Kote Semi-Gloss 403 Line: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
   6. Pittsburgh Paints; 6-1110 Series SpeedHide Interior Enamel Wall & Trim Semi-Gloss Oil: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
   7. 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).

C. Interior Ferrous-Metal Zinc Rich: For Hollow Metal doors.
3.00  EXECUTION

3.01  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.

3.02  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. 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.
   3. 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.
4. Galvanized Surfaces:
   a. Pretreat galvanized surfaces by one of the following methods:
      1). Phosphating: Apply a phosphate-containing solution to form a non-reactive zinc
         phosphate layer on the surface.
      2). Sweep Blasting: Provide a light blast cleaning intended to remove zinc oxides on
         the surface and roughen it without significant removal of the galvanizing. Sweep
         blasting should be performed with soft abrasives. Use an abrasive with a Moh’s
         scale hardness of 5 or less. The particle size should be in the range of 8 to 20
         mils.
   b. 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.

3.03 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, convvector 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. Repair factory finish of doors on tops, bottoms, and side edges the same as faces.

9. Sand lightly between each succeeding 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 indicated on drawings and as listed below.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.

2. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.

3. Mechanical equipment that is indicated 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.

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.

3.04 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.

3.05 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.

3.06 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. Exterior Concrete: Provide the following finish systems over concrete.
   1. Acrylic Semi-gloss, Sherwin Williams Armorseal Tread-Plex or approved equal.

3.07 INTERIOR PAINT SCHEDULE

A. Concrete Unit Masonry (Other than integral color Concrete Masonry Units): Provide the following finish systems over interior concrete masonry:
   1. Low Luster Acrylic Finish: Two finish coats over a block filler.
      a. Block Filler: Concrete unit masonry block filler.
      b. Finish Coats: Interior semigloss acrylic paint.

B. Interior Concrete: Provide the following finish systems over concrete.
   1. Epoxy, Sherwin Williams Armorseal 1000HS or approved equal.

C. Gypsum Board:
   1. Low-Luster Acrylic Enamel Flat Acrylic Finish: Two finish coats finish coats over a primer.
      a. Primer: Interior Gypsum Board Primer
      b. Finish Coats: Interior flat low luster acrylic paint.

D. Ferrous Metal: Provide the following finish systems over ferrous metal:
   1. Semigloss Alkyd-Enamel Finish: Two finish coats over a primer.
      b. Finish Coats: Interior semigloss alkyd enamel.

E. 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.

END OF SECTION
DIVISION 12
FURNISHINGS
12 24 13  ROLLER WINDOW SHADES

1.00  GENERAL

1.01  RELATED DOCUMENTS

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

1.02  SUMMARY

A. Section Includes:
   1. Manually operated roller shades with single rollers.

B. Related Requirements:
   1. Section 06 10 00 “Rough Carpentry” for wood blocking and grounds for mounting roller shades and accessories.
   2. Section 07 92 00 “Joint Sealants” for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.03  ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
   1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

D. Samples for Initial Selection: For each type and color of shadeband material.
   1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.
   1. Shadeband Material: Not less than 10 inches (250 mm) square. Mark interior face of material if applicable.

F. Product Schedule: For roller shades.

1.04  INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.
1.05 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.06 MAINTENANCE MATERIAL SUBMITTALS
A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.07 QUALITY ASSURANCE
A. Installer Qualifications: Fabricator of products.

1.08 DELIVERY, STORAGE, AND HANDLING
A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.09 FIELD CONDITIONS
A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

2.00 PRODUCTS

2.01 MANUFACTURERS
A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.02 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS
A. Manufacturer: MechoShade Systems or approved equal
B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
   1. Bead Chains: Manufacturer’s standard.
      a. Loop Length: Full length of roller shade.
      b. Limit Stops: Provide upper and lower ball stops.
      c. Chain-Retainer Type: Chain tensioner, jamb mounted
C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Shadebands:

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Exposed with endcaps and integral light seal at bottom where it meets the sill.
   b. Color and Finish: As selected by Architect from manufacturer’s full range.

F. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer’s standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 3 inches (76 mm)
2. Endcap Covers: To cover exposed endcaps.
3. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
   a. Closure-Panel Width: 2 inches (51 mm).
4. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
5. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
6. Installation Accessories Color and Finish: As selected from manufacturer’s full range.

2.03 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4 provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

2. Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.

3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer’s written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.

B. Roller Shade Locations: As indicated on Drawings.

3.03 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.04 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer’s written instructions.
B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION
DIVISION 23
HVAC
23 07 13          DUCT INSULATION

1.00      GENERAL

1.01      RELATED DOCUMENTS

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

1.02      SUMMARY

A. This Section includes semi-rigid and flexible duct, plenum, and breeching insulation;
insulating cements; field-applied jackets; accessories and attachments; and sealing
compounds.

1.03      SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field
applied, if any), for each type of product indicated.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having
jurisdiction indicating, interpreting, and certifying test results for compliance of insulation
materials, sealers, attachments, cements, and jackets with requirements indicated. Include
dates of tests.

C. Installer Certificates: Signed by the Contractor certifying that installers comply with
requirements.

1.04      QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an
apprenticeship program or another craft training program certified by the U.S. Department
of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those
specified in this Section according to ASTM E84, by a testing and inspecting agency
acceptable to authorities having jurisdiction. Factory label insulation and jacket materials
and sealer and cement material containers with appropriate markings of applicable testing
and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed
rating of 50 or less.

2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed
rating of 150 or less.

1.05      DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with
appropriate ASTM specification designation, type and grade, and maximum use
temperature.
1.06 COORDINATION
A. Coordinate clearance requirements with duct Installer for insulation application.

1.07 SCHEDULING
A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

2.00 PRODUCTS

2.01 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Mineral-Fiber Insulation:
      a. CertainTeed Manson.
      b. Knauf FiberGlass GmbH.
      c. Owens-Corning Fiberglas Corp.
      d. Schuller International, Inc.
   2. Flexible Elastomeric Thermal Insulation:
      a. Armstrong World Industries, Inc.
      b. Rubatex Corp.

2.02 INSULATION MATERIALS
A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film. (ASTM C612, Type III for operating temperatures higher than 850 F (454 C)).
B. Mineral-Fiber Blanket Thermal Insulation: 0.75 lb./ft³, glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film. (ASTM C553, Type V for operating temperatures higher than 850 F (454 C)).
C. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534, Type II for sheet materials.
   1. Adhesive: As recommended by insulation material manufacturer.
   2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
D. Calcium Silicate Insulation: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a nonasbestos fibrous reinforcement. Comply with ASTM C533, Type I (ASTM C533, Type II for temperatures higher than 1200 F (649 C) up to 1700 F (927 C)).
2.03 FIELD-APPLIED JACKETS

A. General: ASTM C921, Type 1, unless otherwise indicated.


C. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils (0.5 mm) thick; roll stock ready for shop or field cutting and forming.
   1. Adhesive: As recommended by insulation material manufacturer.
   2. PVC Jacket Color: White.

D. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B209 (ASTM B209M), and having an integrally bonded moisture barrier over entire surface in contact with insulation. Metal thickness and corrugation dimensions are scheduled at the end of this Section.
   1. Finish: Smooth finish.
   2. Moisture Barrier: 1-mil (0.025-mm) thick, heat-bonded polyethylene and kraft paper.

E. Stainless-Steel Jacket: Deep corrugated sheets of stainless steel complying with ASTM A666, Type 304 or 316; 0.10 inch (2.5 mm) thick; and roll stock ready for shop or field cutting and forming to indicated sizes.
   1. Moisture Barrier for Corrosive Atmospheres: 1-mil (0.025-mm) thick, heat-bonded polyethylene and kraft paper.
   2. Moisture Barrier for Non-Corrosive Atmospheres: 3-mil (0.075-mm) thick, heat-bonded polyethylene and kraft paper.

2.04 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).
   1. Tape Width: 4 inches (100 mm).

B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:
   1. Stainless Steel: ASTM A66, Type 304; 0.020 inch (0.5 mm) thick.
   2. Galvanized Steel: 0.005 inch (0.13 mm) thick.
   3. Aluminum: 0.007 inch (0.18 mm) thick.
   4. Brass: 0.010 inch (0.25 mm) thick.
   5. Nickel-Copper Alloy: 0.005 inch (0.13 mm) thick.

C. Wire: 0.080-inch (2.0-mm), nickel-copper alloy; 0.062-inch (1.6-mm), soft-annealed, stainless steel; or 0.062-inch (1.6-mm), soft-annealed, galvanized steel.

D. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.
2.05 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.03 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer’s written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:
1. Pull jacket tight and smooth.
2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation according to manufacturer’s written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.
   1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
   2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
   1. Seal penetrations with vapor-retarder mastic.
   2. Apply insulation for exterior applications tightly joined to interior insulation ends.
   3. Seal insulation to roof flashing with vapor-retarder mastic.

P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

Q. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

R. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.
   1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.04 MINERAL-FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.
   1. Apply adhesives according to manufacturer’s recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
   2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
   3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
      a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.

c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

4. Impale insulation over anchors and attach speed washers.

5. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

6. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.

7. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches (450 mm) o.c.

8. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

9. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch (150-mm) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.

10. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

B. Board Applications for Ducts and Plenums: Secure board insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer’s recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Space anchor pins as follows:
   a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
   b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.

6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch (150-mm) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.

8. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.05 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to ducts and plenums as follows:

1. Follow the manufacturer’s written instructions for applying insulation.

2. Seal longitudinal seams and end joints with manufacturer’s recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the duct and plenum surface.

3.06 CALCIUM SILICATE INSULATION APPLICATION

A. Apply insulation according to the manufacturer’s written instructions and as follows:

1. Secure single layer of insulation to duct with stainless-steel bands. Tighten bands without deforming the insulation material.

2. Apply two-layer insulation with joints tightly butted and staggered at least 3 inches (75 mm). Secure inner layer with 0.062-inch (1.6-mm), soft-annealed, stainless-steel wire. Secure outer layer with stainless-steel bands.

3. On exposed applications, without metal jacket, finish insulation with a skim coat of mineral-fiber, hydraulic-setting cement to surface of installed insulation. When dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch (25 mm). Apply finish coat of lagging adhesive over glass cloth or tape. Thin the finish coat to achieve smooth finish.
3.07 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
   1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
   2. Embed glass cloth between two 0.062-inch (1.6-mm) thick coats of jacket manufacturer’s recommended adhesive.
   3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

3.08 FINISHES

A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 09.
B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer’s recommended protective coating.
C. Color: Final color as selected by Architect/Engineer. Vary first and second coats to allow visual inspection of the completed Work.

3.09 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.
C. Insulate the following plenums and duct systems:
   1. Indoor concealed supply-, return-, and outside-air ductwork.
   2. Indoor exposed supply-, return-, and outside-air ductwork.
   3. Indoor concealed range-hood exhaust ductwork.
   4. Indoor concealed oven and dishwasher ductwork.
D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
   1. Fibrous-glass ducts.
   2. Metal ducts with duct liner.
   3. Factory-insulated flexible ducts.
   4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
   5. Flexible connectors.
   7. Testing agency labels and stamps.
   8. Nameplates and data plates.
3.10 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Round and rectangular, supply-air ducts, concealed.
   2. Thickness: 2 inches (50mm).
   3. Number of Layers: One.
   5. Vapor Retarder Required: Yes.

B. Service: Round and rectangular, supply-air ducts, exposed.
   2. Thickness: 1-1/2 inch (38 mm).
   3. Number of Layers: One.
   5. Vapor Retarder Required: Yes.

C. Service: Rectangular, range-hood exhaust ducts, concealed.
   1. Material: Calcium silicate.
   2. Thickness: 2 inches (50 mm).
   3. Number of Layers: As required.
   5. Vapor Retarder Required: No.

D. Service: Round and rectangular, dishwasher exhaust ducts, concealed.
   2. Thickness: 1 inch (25 mm).
   3. Number of Layers: One.
   5. Vapor Retarder Required: Yes.

END OF SECTION
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg (minus 500- to plus 2500-Pa). Metal ducts include the following:
   1. Rectangular ducts and fittings.
   2. Single-wall, round spiral-seam ducts and formed fittings.
   3. Duct liner.

1.03 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

1.04 SUBMITTALS

A. Welding certificates.
B. Field Quality-Control Test Reports.

1.05 QUALITY ASSURANCE

B. NFPA Compliance:
   2. NFPA 90B, “Installation of Warm Air Heating and Air Conditioning Systems.”

2.00 PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 SHEET METAL MATERIALS

A. Comply with SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible” for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A653/A653M and having G60 (Z180) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Aluminum Sheets: ASTM B209 (ASTM B209M), alloy 3003, temper H14; with mill finish for concealed ducts and standard, one-side bright finish for exposed ducts.

D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.03 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term “sealant” is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

B. Joint and Seam Tape: 2 inches (50 mm) wide; glass-fiber-reinforced fabric.

C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.

E. Solvent-Based Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.

F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.04 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
   1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
   2. Strap and Rod Sizes: Comply with SMACNA’s “HVAC Duct Construction Standards—Metal and Flexible” for steel sheet width and thickness and for steel rod diameters.
   3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A36/A36M.
   3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.

2.05 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA’s “HVAC Duct Construction Standards—Metal and Flexible” and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
   1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
   2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA’s “HVAC Duct Construction Standards—Metal and Flexible.”

B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer’s guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
   1. Manufacturers:
      a. Ductmate Industries, Inc.
      b. Nexus Inc.
      c. Ward Industries, Inc.

C. Formed-On Flanges: Construct according to SMACNA’s “HVAC Duct Construction Standards—Metal and Flexible,” Figure 1-4, using corner, bolt, cleat, and gasket details.
   1. Manufacturers:
      a. Ductmate Industries, Inc.
      b. Lockformer.
2. Duct Size: Maximum 30 inches (750 mm) wide and up to 2-inch wg (500-Pa) pressure class.
3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359 inch (0.9 mm) thick or less, with more than 10 sq. ft. (0.93 sq. m) of nonbraced panel area unless ducts are lined.

3.00 EXECUTION

3.01 DUCT APPLICATIONS
A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
   1. Supply Ducts: 1-inch wg (250-Pa)
B. All ducts shall be galvanized steel.

3.02 DUCT INSTALLATION
A. Construct and install ducts according to SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible,” unless otherwise indicated.
B. Install round and flat-oval ducts in lengths not less than 12 feet (3.7 m) unless interrupted by fittings.
C. Install ducts with fewest possible joints.
D. Install fabricated fittings for changes in directions, size, and shape and for connections.
E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches (300 mm), with a minimum of three screws in each coupling.
F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
I. Concel ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Section 23 33 00 “Air Duct Accessories.” Firestopping materials and installation methods are specified in Division 07 Section.

O. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA’s “Duct Cleanliness for New Construction.”

P. Paint interiors of metal ducts, that do not have duct liner, for 24 inches (600 mm) upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.03 PVC-COATED DUCT, SPECIAL INSTALLATION REQUIREMENTS

A. Repair damage to PVC coating with manufacturer’s recommended materials.

3.04 RANGE HOOD EXHAUST DUCTS, SPECIAL INSTALLATION REQUIREMENTS

A. Install ducts to allow for thermal expansion through 2000 F (1110 C) temperature range.

B. Install ducts without dips or traps that may collect residues unless traps have continuous or automatic residue removal.

C. Install access openings at each change in direction and at intervals defined by NFPA 96; locate on sides of duct a minimum of 1-1/2 inches (38 mm) from bottom; and fit with grease-tight covers of same material as duct.

D. Do not penetrate fire-rated assemblies except as permitted by applicable building codes.

3.05 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible” for duct pressure class indicated.

3.06 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

B. Support vertical ducts at maximum intervals of 16 feet (5 m) and at each floor.

C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

3.07 CONNECTIONS
A. Make connections to equipment with flexible connectors according to Section 23 33 00 “Air Duct Accessories.”

B. Comply with SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible” for branch, outlet and inlet, and terminal unit connections.

3.08 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections according to SMACNA’s “HVAC Air Duct Leakage Test Manual” and prepare test reports:

1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.

2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give 7 days’ advance notice for testing.

3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (500-Pa) (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg (500- to 2500-Pa).

4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

3.09 CLEANING NEW SYSTEMS

A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.

B. Use service openings, as required, for physical and mechanical entry and for inspection.

1. Create other openings to comply with duct standards.

2. Disconnect flexible ducts as needed for cleaning and inspection.

3. Remove and reinstall ceiling sections to gain access during the cleaning process.

C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).

2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.

3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.

5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.

E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

F. Cleanliness Verification:
1. Visually inspect metal ducts for contaminants.
2. Where contaminants are discovered, re-clean and reinspect ducts.

3.10 CLEANING EXISTING SYSTEMS

A. Use service openings, as required, for physical and mechanical entry and for inspection.
   1. Use existing service openings where possible.
   2. Create other openings to comply with duct standards.
   3. Disconnect flexible ducts as needed for cleaning and inspection.
   4. Reseal rigid fiberglass duct systems according to NAIMA recommended practices.
   5. Remove and reinstall ceiling sections to gain access during the cleaning process.

B. Mark position of dampers and air-directional mechanical devices before cleaning, and restore to their marked position on completion.

C. Particulate Collection and Odor Control:
   1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron size (or larger) particles.
   2. When venting vacuuming system to the outside, use filtration to contain debris removed from HVAC system, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:
   1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.

3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.


5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.


7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.

3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.

4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.

5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

6. Provide operative drainage system for washdown procedures.

7. Biocidal Agents and Coatings: Apply biocidal agents if fungus is present. Apply biocidal agents according to manufacturer’s written instructions after removal of surface deposits and debris.

F. Cleanliness Verification:

1. Verify cleanliness after mechanical cleaning and before application of treatment, including biocidal agents and protective coatings.

2. Visually inspect metal ducts for contaminants.

3. Where contaminants are discovered, re-clean and reinspect ducts.

G. Gravimetric Analysis: At discretion and expense of Owner, sections of metal duct system, chosen randomly by Owner, may be tested for cleanliness according to NADCA vacuum test gravimetric analysis.

1. If analysis determines that levels of debris are equal to or lower than suitable levels, system shall have passed cleanliness verification.
2. If analysis determines that levels of debris exceed suitable levels, system cleanliness verification will have failed and metal duct system shall be re-cleaned and re-verified.

H. Verification of Coil Cleaning: Cleaning must restore coil pressure drop to within 10 percent of pressure drop measured when coil was first installed. If original pressure drop is not known, coil will be considered clean only if it is free of foreign matter and chemical residue, based on thorough visual inspection.

END OF SECTION
1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Backdraft dampers.
   3. Fire and smoke dampers.
   4. Turning vanes.
   5. Remote damper operators.
   6. Duct-mounted access doors and panels.
   7. Flexible ducts.
   8. Flexible connectors.
   9. Duct accessory hardware.

1.03 SUBMITTALS

A. Product Data: For the following:
   1. Backdraft dampers.
   3. Fire and smoke dampers.
   4. Duct-mounted access doors and panels.
   5. Flexible ducts.

B. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.04 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:
1.05 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. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

2.00 PRODUCTS

2.01 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A653/A653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A366/A366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

C. Aluminum Sheets: ASTM B209 (ASTM B209M), Alloy 3003, Temper H14, sheet form; with standard, one-side bright finish for ducts exposed to view and mill finish for concealed ducts.


E. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.02 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations.

B. Frame: 0.052-inch (1.3-mm) thick, galvanized, sheet steel, with welded corners and mounting flange.

C. Frame: 0.090-inch (2.3-mm) thick extruded aluminum, with mounting flange.

D. Blades: 0.050-inch (1.2-mm) thick extended aluminum sheet.

E. Blade Seals: Vinyl.

F. Blade Axles: Nonferrous (for aluminum dampers).

G. Blade Axles: Galvanized steel (for steel dampers).

H. Tie Bars and Brackets: Aluminum (for aluminum dampers).

I. Tie Bars and Brackets: Galvanized steel (for steel dampers).

J. Return Spring: Adjustable tension.
2.03 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classifications of 3-inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

B. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating, and suitable for horizontal or vertical applications.

1. Comply with AMCA 500-D testing for damper rating.

2. Low-leakage rating and bearing AMCA’s Certified Ratings Seal for both air performance and air leakage.

3. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch (1.62 mm) thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.

4. Aluminum Frames: Hat-shaped, 0.10-inch (2.5-mm-) thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts

5. Roll-Formed Steel Blades: 0.064-inch (1.62-mm) thick, galvanized, sheet steel.

6. Roll-Formed Aluminum Blades: 0.10-inch (2.5-mm) thick aluminum sheet.


10. Tie Bars and Brackets: Aluminum (for aluminum dampers).

11. Tie Bars and Brackets: Galvanized steel (for steel dampers).

C. Jackshaft: 1-inch (25-mm) diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.

D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch (2.4-mm) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.04 FIRE DAMPERS

A. General: Labeled to UL 555.

B. Fire Rating:
1. One and one-half hours for 2-hour walls.
2. Three hours for 4-hour walls.

C. Frame: SMACNA Type A with blades in airstream; fabricated with roll-formed, 0.034-inch (0.85-mm) thick galvanized steel; with mitered and interlocking corners.

D. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch (0.85-mm) thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.
   1. Minimum Thickness: 0.052 inch (1.3 mm) or 0.138 inch (3.5 mm) thick as indicated, and length to suit application.
   2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch (0.85-mm) thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch (0.85-mm) thick, galvanized steel blade connectors.

H. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.

I. Fusible Link: Replaceable, 165 or 212 F (74 or 100 C) rated as indicated.

2.05 CEILING FIRE DAMPERS

A. General: Labeled to UL 555C; comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL’s “Fire Resistance Directory.”

B. Frame: 0.040-inch (1.0-mm) thick, galvanized, sheet steel; round or rectangular; style to suit ceiling construction.

C. Blades: 0.034-inch (0.85-mm) thick, galvanized, sheet steel with nonasbestos refractory insulation.

D. Fusible Link: Replaceable.
   1. 165 F (74 C), as applicable.
   2. 212 F (100 C).
   3. 285 F (141 C).

2.06 SMOKE DAMPERS

A. General: Labeled to UL 555S. Combination fire and smoke dampers shall be labeled for 1-1/2-hour rating to UL 555.

B. Fusible Link: Replaceable, 165 or 212 F (74 or 100 C) rated as indicated.

C. Damper Motors: Provide for modulating or two-position action.
   1. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
2. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).

3. Outdoor Motors and Motors in Outside-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 F (minus 40 C).

4. Nonspring-Return Motors: For dampers larger than 25 sq. ft. (2.3 sq. m), size motor for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 300 in. x lbf (34 N x m).

5. Two-Position Motor: 115 V, 1 phase, 60 Hz.

2.07 TURNING VANES

A. Fabricate to comply with SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible.”

B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch (38-mm) wide, curved blades set 3/4 inch (19 mm) o.c.; support with bars perpendicular to blades set 2 inches (50 mm) o.c.; and set into side strips suitable for mounting in ducts.

C. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.08 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct.

B. General: Fabricate doors and panels airtight and suitable for duct pressure class.

C. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.

D. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

E. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

F. Insulation: 1-inch (25-mm) thick, fibrous-glass or polystyrene-foam board.

2.09 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch (70-mm) wide, 0.028-inch (0.7-mm) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.
C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch (70-mm) wide, 0.028-inch (0.7-mm) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

D. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 4-3/8-inch (111-mm) wide, 0.028-inch (0.7-mm) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

   1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
   2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.

F. Conventional, Outdoor System (minus 10 to plus 250 F) Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun’s ultraviolet rays and ozone environment.
   1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
   2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp, and 440 lbf/inch (77 N/mm) in the filling.

G. High-Temperature System (minus 25 to plus 500 F) Flexible Connectors: Glass fabric coated with silicone rubber and having a minimum weight of 16 oz./sq. yd. (542 g/sq. m) and tensile strength of 285 lbf/inch (50 N/mm) in the warp, and 185 lbf/inch (32 N/mm) in the filling.

H. High-Corrosive-Environment System (minus 20 to plus 500 F) Flexible Connectors: Glass fabric coated with a chemical-resistant coating.
   1. Minimum Weight: 14 oz./sq. yd. (474 g/sq. m).
   2. Tensile Strength: 450 lbf/inch (79 N/mm) in the warp, and 340 lbf/inch (60 N/mm) in the filling.

2.10 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Uninsulated: Spiral-wound steel spring with flameproof vinyl sheathing.

C. Flexible Ducts, Uninsulated: Corrugated aluminum.

D. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch (38-mm) thick, glass-fiber insulation around a continuous inner liner.
   1. Reinforcement: Steel-wire helix encapsulated in inner liner.
   2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
   3. Inner Liner: Polyethylene film.

E. Pressure Rating: 6-inch wg (1500-Pa) positive, 1/2-inch wg (125-Pa) negative.
2.11 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

3.00 EXECUTION

3.01 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible” for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.

D. Provide test holes at fan inlet and outlet and elsewhere as indicated.

E. Install fire and smoke dampers according to manufacturer’s UL-approved written instructions.
   1. Install fusible links in fire dampers.

F. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.
   1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
   2. Install access panels on side of duct where adequate clearance is available.

G. Label access doors.

3.02 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Adjust duct accessories for proper settings.
   2. Operate dampers to verify full range of movement.
   3. Inspect locations of access doors and verify that purpose of access door can be performed.
4. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.

5. Inspect turning vanes for proper and secure installation.

6. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION